

Interiors

Many people interested in photographing buildings are content to show them only from the outside, but there are equally interesting shots to be had by venturing inside. So what should you look for?

Photography is so often regarded as an outdoor activity, that many amateurs overlook the photogenic possibilities to be found indoors. Photographers tend to use interiors simply as locations for studio work and fail to notice all the subject matter that rooms themselves can provide. Yet the world has many rooms, old and new, grand and humble, large and small, and each may reveal just a little of the way people live or provide a scene as attractive as any landscape.

Too often photographers working on interiors become distracted by the technical problems, at the expense of creativity. Technical problems—such as lighting, long exposures, reciprocity failure and so on—are important and do need careful attention, but it is easy to become preoccupied with technique. Many photographers simply concentrate on lighting every corner of the room and ensuring that illumination is even—their pictures are frequently dull and lifeless. Although some shots may require skilful technique and elaborate lighting, strong and effective interiors can equally well be taken with a bare minimum of equipment and illumination.

Perhaps the best way to establish the appropriate treatment is to analyze the character of the room and pick out its most important features, such as any obvious architectural feature. Often the architect or designer of public buildings will have deliberately organized the room around a particular visual focus. There may be columns for instance, to lead the eye up to a vaulted ceiling and the room may only be seen at its best from one particular viewpoint.

But it can be something less tangible. It may be the way a domestic room reflects the personality of the occupant. In a stately home or palace, the most lasting impression is of opulence and elaborate decoration. Whatever the most important feature is, it can provide the clue to the approach. Concentrate on this feature and use the lighting and composition to show it to best effect.

If you can, it is better to establish the composition before you decide on the lighting. Unfortunately, it is often impossible to make a separate decision since the location of windows and lamps affect the composition in the layout of the room. In larger buildings, take advantage of any high viewpoints that are available. If you can climb up stairs or position yourself on an upper balcony you may find that you can get some



Michael Freeman

Library of Congress *A combination of daylight and artificial light was used here, and a large format camera was used for maximum sharpness*

unusual shots looking down.

The major difficulty in composing an interior view is that it is not possible to reproduce the effect of actually being in the room yourself. In reality, although your eyes may focus on a relatively small area of interest, you are nevertheless aware of the entire surroundings, and so, in effect, experience the room on two levels. A photograph, however, can only show a limited area, even with a wide angle lens, so that important parts of the room may have to be left out of the

shot. In a standard view, for example, there is no satisfactory way of including the ceiling.

The popular solution is to aim for as wide a coverage as possible, positioning the camera in a corner and fitting a wide angle lens with a field of at least 75°, that is, a 24 mm lens or shorter on a 35 mm camera, or 40 mm or shorter on a rollfilm model. In most situations this works well, but beware of reaching for your widest angle lens without thinking—wide coverage is not always the best solution, and there are occasions when the key feature of an interior can be better captured with a more moderate focal length. If not used with care, a wide angle lens often gives a cavernous

impression, which may not suit the mood of every interior.

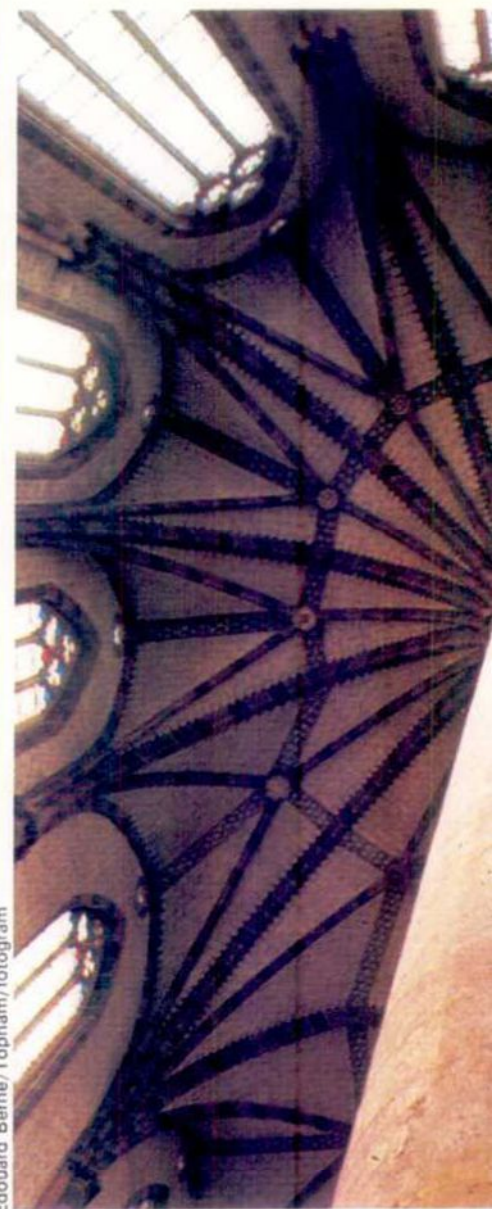
A technical problem that is related to viewpoint and aggravated by a wide angle lens is the convergence of vertical lines. This is dealt with more fully in a subsequent article. Although this convergence is a perfectly normal feature of perspective, identical to the convergence of horizontal lines that you can see in a receding row of houses, it is less readily accepted by the eye when reproduced in a photograph.

Although the problem of converging verticals is often over-emphasised at the expense of other, more aesthetic considerations, it is usually worth trying to solve. As a guiding principle, it is slight convergence that is the most objectionable, as it gives the impression, normally for good reasons, of being unintentional and a result of sloppy craftsmanship. Strong deliberate convergence, achieved by tilting the camera upwards at a sharp angle, is by contrast, often

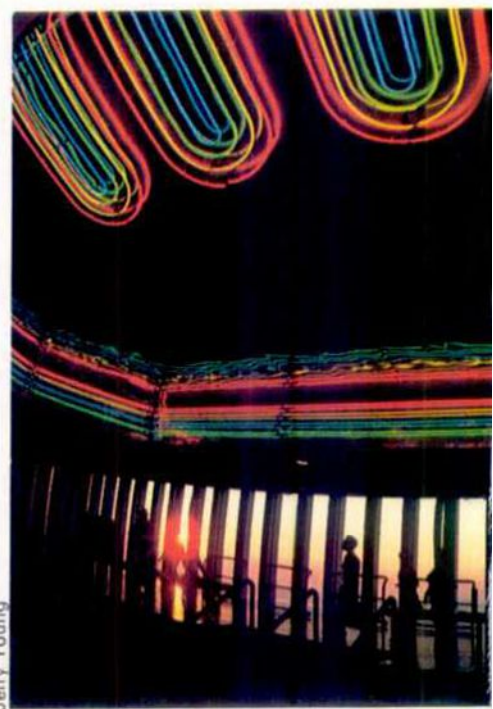
successful, particularly with interiors that have rich ceiling detail. Interestingly, downward convergence, which you can see when photographing an interior from a high balcony, is generally acceptable—possibly because this viewpoint is sufficiently uncommon for us not to have preconceived ideas about the 'correctness' of the perspective.

The simplest solution, though, is effective composition—including foreground elements to balance the view and filling empty space at the bottom of the image. In domestic interiors you can move furniture around to suit the composition, but in public buildings, you must normally move the camera. With a wide angle lens, relatively slight changes in the camera position can have noticeable effects on the image, particularly with objects close to the lens.

Staircase *An interior shot may be just as effective if only a small area is framed, such as this spiral staircase*



Edouard Berne/Topham/fotogram



Jerry Young



Stephen Green-Armystage/Image Bank



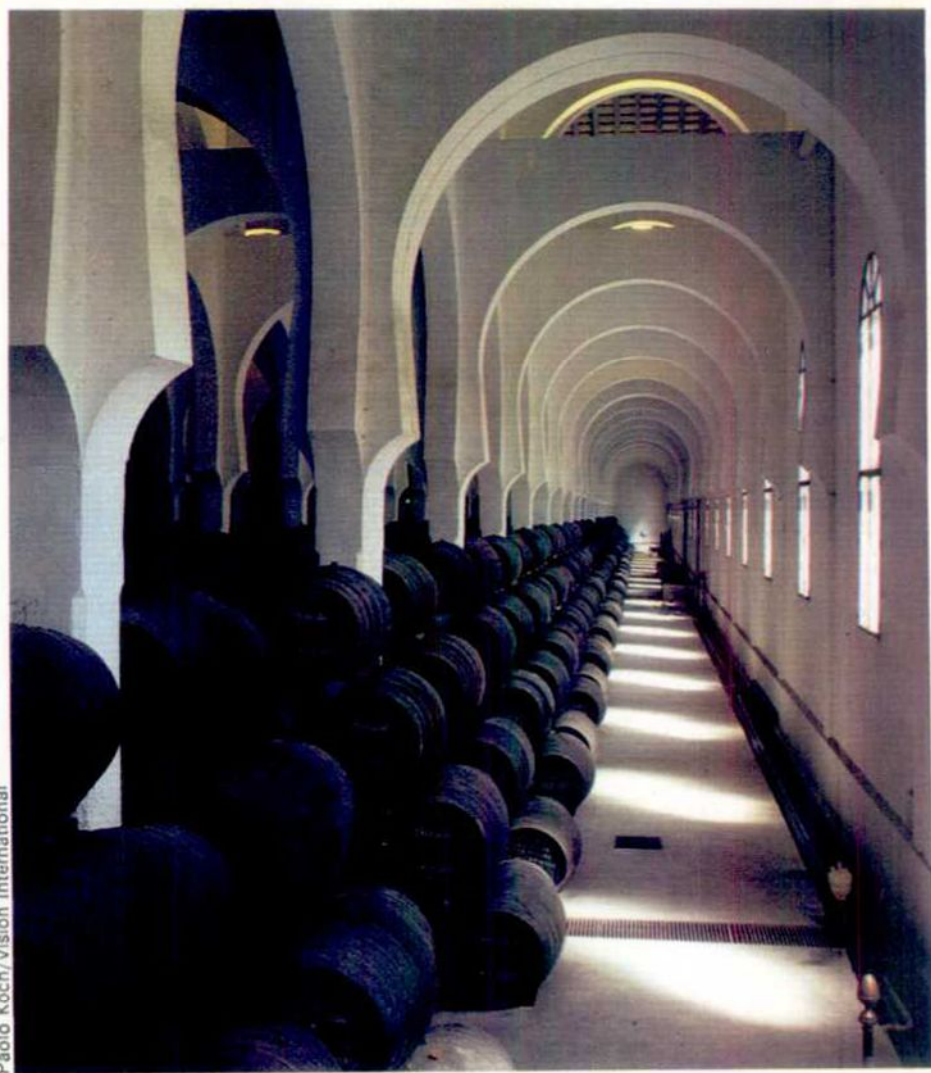
Looking up Here the central pillar was used to improve the composition and to lead the eye to the ornate ceiling

Neon lights An ultra-wide lens was used to bring together a mixture of indoor and outdoor subjects and lighting

Steve Herr/Vision International



Paolo Koch/Vision International



Staircase Details of interiors are a good way of showing the craftsmanship of a fine building

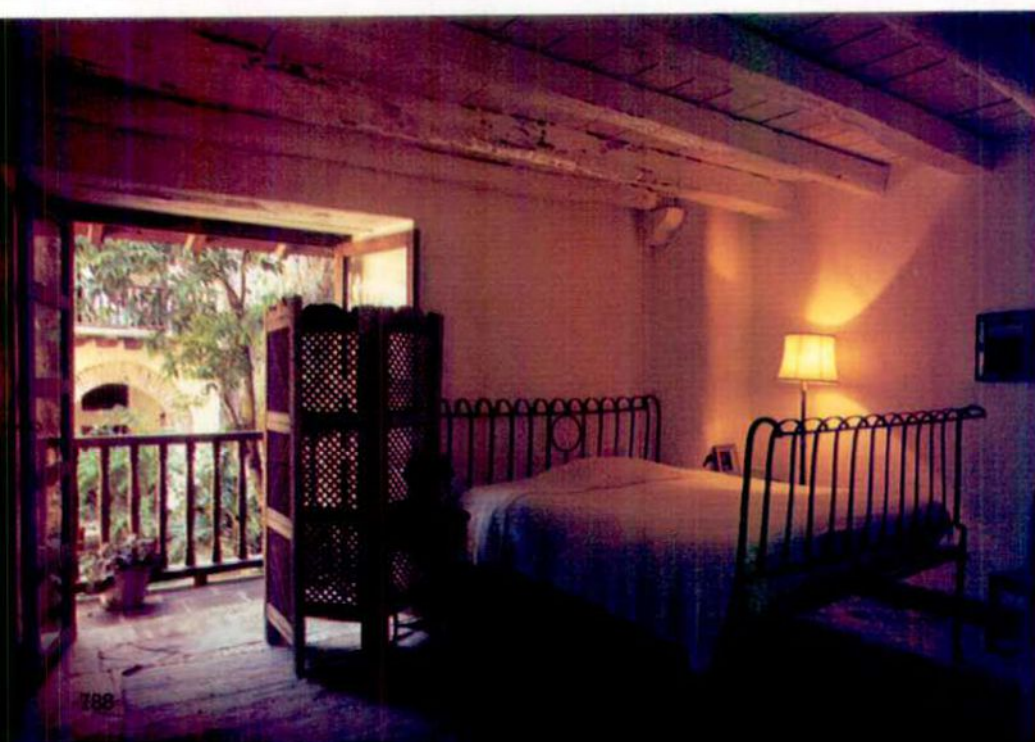
Sherry winery Careful framing has ensured that the arches recede into the distance in perfect symmetry



Michael Freeman



Ian McKinnell



Michael Freeman

Balcony The photographer stood half way up the stairs to avoid converging verticals and included the stair rail to balance the foreground with the rest of the scene. **Bedroom** A small tungsten light adds interest to the right side of the room. **Staircase** Modern interiors offer many striking details

In fact, a wide angle lens has a number of other very useful properties. One of its most obvious benefits is a strong illusion of depth, created by the pronounced convergence of horizontal lines—sometimes called *linear perspective*—and by the exaggerated difference in



Michael Freeman

size between foreground and background. The value of this is that by including small objects in the foreground, such as a lamp or a book on a table, you can show an overall view of the room and give some idea of its contents in one shot. This treatment demands sharpness throughout the image, and although a wide angle lens has good depth of field, you still need a small aperture.

Sometimes, the format of the photograph—horizontal or vertical—suggests itself quite naturally, according to the nature of the interior and the viewpoint. If the proportions of the room favour height, such as in a cathedral or a Regency house, then a vertical frame is the obvious choice. But think carefully before using vertical format—it can be difficult to compose the foreground. A horizontal format is probably easier to frame, but inevitably misses anything close to or on the ceiling. Often it is hard to decide on the spot and it is worth taking a shot in each format.

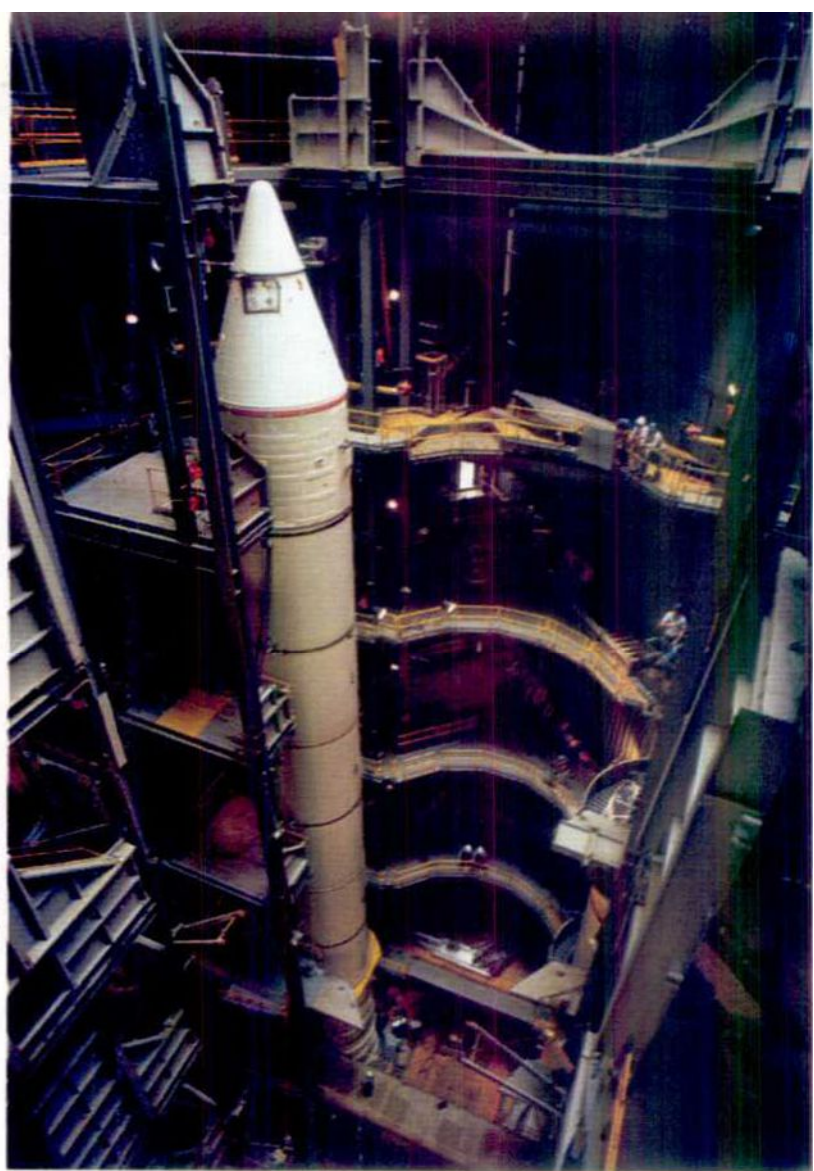
Lighting is an integral part of the appearance of any interior, so before taking any decisions about supplementary lighting, look carefully at the normal room lighting, and pay special attention to the balance of different light sources. Most interiors receive at least some daylight, so that the time of day and weather conditions can make an important difference. On a bright day, an interior that has a large amount of window space will be so well lit that its own artificial lighting—table lamps, fluorescent lighting and others—would make no significant contribution. Towards evening, however, the balance between daylight and artificial sources

Indoor pool Vapour
lighting created an unusual colour cast but this suited the nature of the subject and added further interest to the pool

swings in the opposite direction, and you should, if you have the time and opportunity, decide on the effect you prefer. Often, switching on a table lamp or wall fitting, even if it adds little to the overall illumination, may be an attractive way of lifting part of the room and giving a subtle alteration to the composition.

Remember, though, that the natural light shows the room as it is normally—and perhaps as it was designed to be seen. For example, the interiors of many cathedrals were designed to be aesthetically satisfying by natural light alone. Even more forcefully, the trompe l'oeil ceilings and murals found in many 17th and 18th century palaces show how good architects used lighting as part of the design. Indiscriminately adding your own lights can alter the character of an interior, not necessarily to good effect.

Nevertheless, if you do add your own lighting, you can put it to use in one of two ways: either to supplement the existing scheme, or to replace it. Supplementary lighting may be needed simply to translate onto film or a print the impression you receive by eye. If you measure the light levels in different parts of a room, you will probably find that the contrast range across the entire scene is high. Many interiors have windows along one wall only, so that by day there may be a difference of several f-stops from one side of the room to



Space shuttle booster In the assembly hangar, light came only from overhead and 1 second exposure time was needed

another. At night, most rooms, particularly domestic interiors, are lit by single, separate lamps, and in the photograph this gives an effect of pools of light and deep shadows. Because of the way the eye functions—scanning a scene rapidly and making fast adjustments to different light levels—this high contrast is not very noticeable in reality, but on film it appears exaggerated. For this reason, you may need to use lighting to fill in the shadow areas to even out balance. If so, any additional lighting should be unobtrusive, and the easiest way of achieving this is to diffuse the lamp with tracing paper or other translucent material; removing hard shadow edges disguises extra lighting.

An alternative method that you can use in a large interior with structural features such as columns or alcoves is to conceal lamps behind them, pointing away from the camera. This mimics an interior's artificial lighting, and, in large dimly lit interiors, may be the only satisfactory way. If the overall light level is low, it may be possible to leave the camera shutter open and walk yourself from pillar to pillar, standing behind each and firing a portable flash unit so that the room is lit adequately.

Improve your technique

Directing a model

Directing a model to give exactly the results you want is certainly not as easy as it seems. But there are a few guidelines you can follow to put your model at ease and help make picture sessions run smoothly

Many people have an image of the professional photographer working slickly through a session with a model, moving swiftly from pose to pose with just an occasional 'Hold it!' to break the flow. Few amateurs can work this easily with a model, though, and results from even the most informal session often look stiff and lifeless. There is no easy solution to this problem, but here are a few tricks of the trade to help improve your confidence and make it easier for the model to settle into the session.

It is usually easy to tell when a photographer has a rapport with a model, just by looking at the contact sheet or slides from the session. Poses are relaxed, and the pictures have a natural look to them. When the photographer has had difficulty with a session, this too is frequently obvious. The pictures look stilted, the model looks awkward and uncomfortable, and it is clear that there was very little communication between photographer and subject.

Perhaps the most important thing is to know before you begin the session exactly what type of pictures you want. Write down as much as you can about each photograph. Make a note of the kind of lighting you want to use, the location you have in mind, and the general atmosphere of the final image. With a clear idea of what you want, you can explain your plans to the model briefly and confidently. If you are unclear in your own mind, your directions to the model will be unclear too.



A relaxed pose *Inexperienced models are often given away by their hands. A simple prop gives them something to do*

Discuss with the model what sort of clothes are needed for the pictures—it is a good idea to have a change of clothes on hand if possible, to add variety. Think about hand props too, because these can give a nervous model confidence. Smokers particularly find it hard to know where to put their hands if they are not holding a cigarette. Holding an umbrella can give a model something to do, and take away the feeling of having 15 fingers.

Immediately before meeting your model to take the photographs, check that you have everything you need, and in the case of film, more than you need. This may sound obvious, but scrabbling in a gadget bag for a lens you left at home quickly breaks a model's concentration, and running out of film brings a session to an abrupt end.

Helping the model to relax

Professional models are expert at looking calm and comfortable in front of the camera, but for people who are unused

Use a tripod *A hand-held camera can act as a barrier between the photographer and model. But if it is set on a tripod, you can concentrate on directing the model without having to spend lots of time framing up*

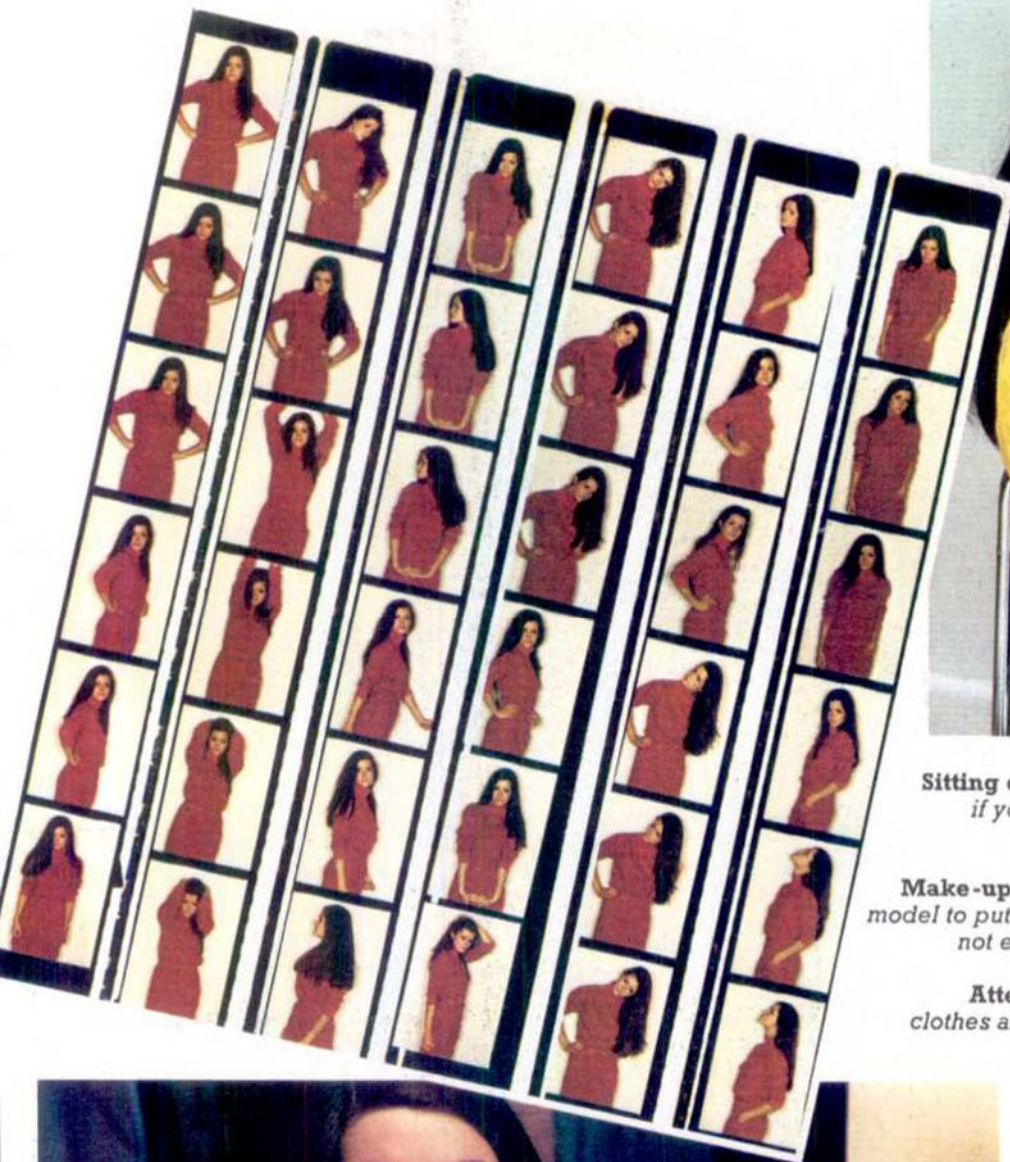
to it, having a picture taken can be an ordeal. Do all you can to make your subject feel at ease. If you are working in a studio, whether it is purpose built or improvised, make sure it is warm and reasonably comfortable. Music is a great help, and fills any awkward silences while you are changing film or lights.

If your model seems nervous on arriving, do not be too eager to start taking pictures, and allow plenty of time to relax. Nude picture sessions present special problems, and these are covered in more detail on pages 177 to 181, and 370 to 372.

If you are working with an inexperienced model, it is sometimes a good idea to suggest that they bring a friend or relative along. This can give a much needed boost to their confidence: the friend might also help by holding reflectors, or touching up make up. Try and exclude all other people since it is difficult for anyone to look relaxed and natural if they are surrounded by a curious crowd. Professional models though, should be used to a busy studio.

Make as many preparations as you can before the session. Arrange the lighting as far as possible and take exposure meter readings from a stand-in in the model's position. Unless the lighting changes, you should be able to retain the same reading for the whole of the session. With adequate planning and preparation, you can concentrate on taking pictures without worrying about the technicalities.

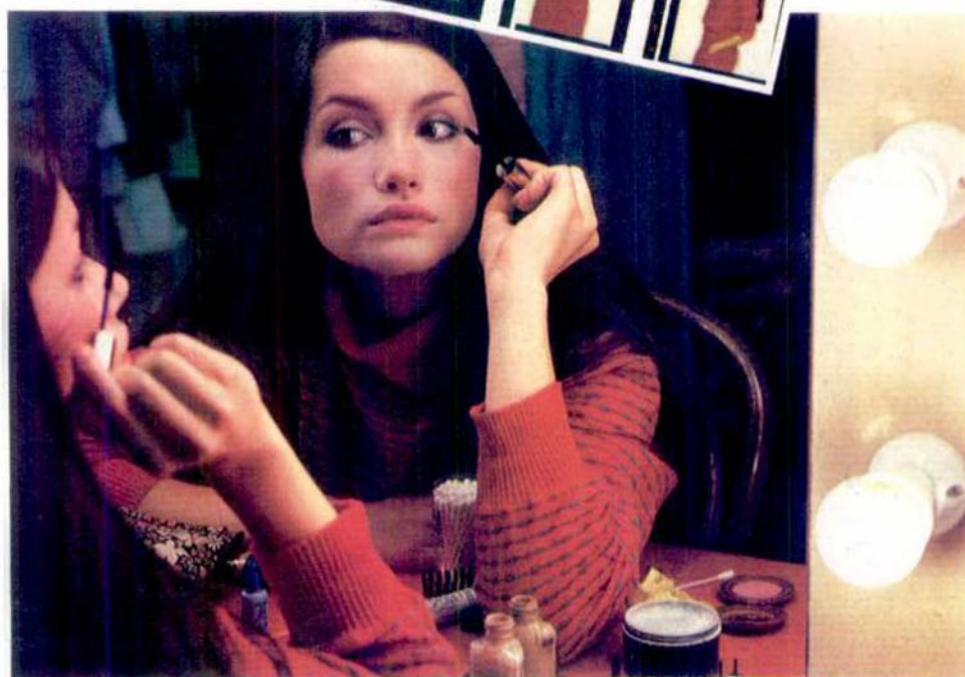




Sitting down Pictures are more likely to be better if your model is comfortable. A seated pose is easier than standing

Make-up Remember to provide somewhere for the model to put on make-up. A proper theatrical mirror is not essential, but the area should be brightly lit

Attention to detail Take great care arranging clothes and hair. Small details that look insignificant at the time can easily spoil the picture



Jake Wynter

Once you begin shooting, try and keep the model occupied all the time. A regular flow of conversation and encouragement helps a lot—everybody wants to be told that they are doing well, and you should try and provide this reassurance, even if you are not convinced that the pictures are any good. Work quickly, and do not try to economize on film. People tend to tense themselves just before the shutter is released, and then relax when they hear

a click. A series of exposures in rapid succession is often better than a single frame, because the model does not have time to assume a fixed expression before each picture is taken. This is one reason why so many professional photographers shoot many rolls of film and use motor drives so they can work quickly.

Most models relax as a session progresses, so if things start badly, do not worry too much—they usually pick up momentum later. Often the best

pictures from a session are the last dozen or so on the final roll of film, and the earlier shots are generally poor.

On the other hand, do not allow yourself to get carried away and push the model to the point of exhaustion. As soon as attention begins to flag, take a break and have a cup of coffee, or bring the session to an end. Working as a model can be very tiring, and it is easy to forget this, particularly if the session seems to be going well.

Using a tripod

Many photographers feel that clamping a camera to a tripod produces a rather rigid, inflexible type of picture. While this may be true for certain types of photography, a tripod can be a great asset when working with a model. It allows you to set the camera up at a fixed point, and take pictures without constantly squinting through the viewfinder. You can stand beside the camera, or just behind it, instead of bending down and hiding your face behind the lens. Using a long cable release and an autowinder allows you to get closer still. This makes it much easier to build up a relationship with a model, who can watch your reactions to a change in pose or expression. If you are unsure about the framing of the picture, mark the background with tape or string so that



Out of doors Avoid static poses, such as standing the model on a patch of grass with nothing to do. Look for props, such as trees and walls



Shiny skin Watch out for shiny skin highlights, on men as well as women. A touch of powder is all that is needed to eliminate a shiny nose

you can see where the edge of the viewfinder frame comes without having to look through the camera.

Posing the model

Models who can provide an endless and varied stream of natural poses are rare, and even an experienced model needs to have some sort of direction from the photographer. If you have difficulty in knowing where to start, look out for examples of the type of pictures you are aiming for, and cut them out of magazines and newspapers. A scrapbook made up like this should not be slavishly followed, but makes a good starting point. You may be able to use your scrapbook to show the model the type of pictures you want to take on the session.

Do not forget that some poses are easier for a model to deal with than others. Standing up in an open space without anything to do can be demanding from a model's point of view, and seated or prone poses are much easier—on a chair or bench, the model generally produces far more lively poses and often has somewhere to put hands. Out of doors, look for anything that the model



can lean over, lean against or sit on. Benches, trees, walls and balustrades are all useful props. Inside, any piece of furniture can assist a model in finding an original pose.

Even if you start the session with well formed ideas about the poses you want your model to adopt, be pragmatic and try out any ideas that may emerge spontaneously in the course of the session. If any pose seems to be particularly successful, do not be impatient to move on, but stay with it, and work on small changes of position and expression, while retaining the same basic picture.

On the other hand, do not go to the other extreme, and keep the model locked into one position for hours on end. Keep some life and action in the pictures, even literally—if there is enough space, get the model to move around a bit. This is easily done if you are out of doors, because you can prefocus on a fixed point, and have the model walk towards you, or in circles around the camera. Avoid obvious clichés, though—subjects like 'jump for joy' have been done to death.

Indoors, avoiding static poses is more difficult, but you can get the model's hair or clothes moving with a fan or hair dryer or by waving a sheet of cardboard. If the model has long hair, a shake of the head does the job just as well. All these ploys put a bit of movement into an otherwise static picture.

Head and shoulders portraits can be more intimidating for a model than full length pictures, because the camera is so much nearer. Use a long lens if there is enough room to move back—even

a 200 mm lens is not too long, but anything with a focal length over 100 mm is good enough. For headshots like this, a mirror placed alongside the model is useful, for a quick check on expression, hair and make up. Prop the mirror up so that the model can see the reflection without a turn of the head. A few fashion photographers use a posing mirror like this out of doors. Fixed to the top of a lighting stand, it is placed next to the model, just out of shot.

If any pose feels unnatural for the model, it is unlikely that it will look good on film, so, in general, use more relaxed postures in which the model feels comfortable and confident. If someone says 'Don't shoot from that side, my other side is better' or 'I never sit like this, I'll look silly', they are probably right, and you should try something else.

Stepping out

Action gives life to pictures—ask the model to walk towards you, preset the focus and release the shutter as soon as the model is sharp

Simulated breeze

Wind-blown hair looks attractive in studio shots. Set the model's hair in motion with a piece of card, electric fan or hair dryer

After the session

It is a matter of common politeness to show the pictures you shoot to the model, unless you are paying the full professional rate—which is considerable. If the model was unpaid, then a set of prints would probably be very welcome. If your pictures are good enough, you may be able to get a steady flow of willing sitters this way, because professional photographers charge high fees for producing a folio of prints for an aspiring model—this should be a fair reward for your model's time and effort.

There is no real secret to working successfully with a model, more than anything it is a question of experience. As you begin to photograph models more and more, your confidence will grow—the results should show in your gradually improving photographs.



Invisible light

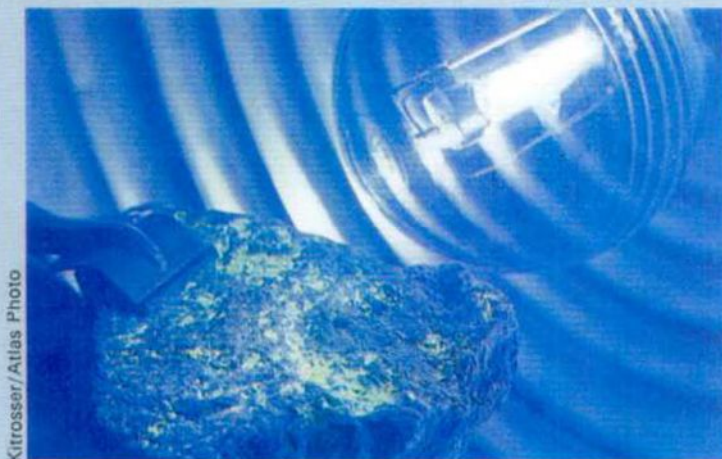
Infrared and ultraviolet light cannot be seen by the unaided human eye. But with special materials and equipment, photography can utilize these wavelengths

'Photography by invisible light' is a term often used to describe ultraviolet and infrared photography. Purists would scoff at the mixture of meanings — as by definition, light is visible—yet the term is not inappropriate. For it is quite possible to take perfect photographs in conditions which even the most sensitive eye would see as totally black.

Such photography is more than a trick—it is of great value in surveillance work, and in numerous scientific applications. In many cases special materials, equipment and techniques are needed, but even with an ordinary camera it is possible to take infrared pictures.

What we see as light forms just part of the *electromagnetic spectrum* (see page 198). It is the radiation with wavelengths between 400 nm and 700 nanometres (nm)—violet light and red light respectively. At other wavelengths shorter and longer than these values, the eye sees nothing. But radiation is still present, behaving in just the same way as visible light.

Radiation with a wavelength shorter than 400 nm, down to about 1 nm, is called *ultraviolet* (UV). Beyond the red end of the spectrum at 700 nm lies the *infrared* (IR), extending to wavelengths as long as 14,000 nm. Only part of the whole UV and IR ranges can be recorded by photography, however.



Kittrosser/Atlas Photo

Within limits, UV and IR can be focused by lenses, and affect film which is suitably sensitized. The other main requirements for photography by invisible light are sources of UV and IR radiation which are sufficiently bright, and, possibly, filters to limit the wavelengths used or lenses which will not absorb the radiation.

Materials

Photographic materials are naturally sensitive to UV, which means that they can be used without modifications, down to about 230 nm; beyond this gelatin in the emulsion starts to absorb UV. Then special materials with very little gelatin or with fluorescent coatings are used.

Infrared film has special dye sensitization (see page 534) to extend the normal limit of sensitivity from 700 to about 900 nm. Special

UV fluorescence *Uranium ore, like some other substances, fluoresces in UV, and can be photographed normally*

materials can reach a maximum of about 1300 nm. Infrared film is noticeably grainy and needs to be kept cool to retain its sensitivity. A special film, Infrared Ektachrome, has an infrared sensitive layer, and by means of an unconventional arrangement of the image dyes in the other layers produces false colour effects. It has uses in aerial survey work.

Lenses and focusing

Because UV and IR have somewhat different wavelengths from visible light, they are refracted by conventional lenses to a slightly different extent, as the amount by which light is refracted depends on its wavelength (see page 271). Most lenses

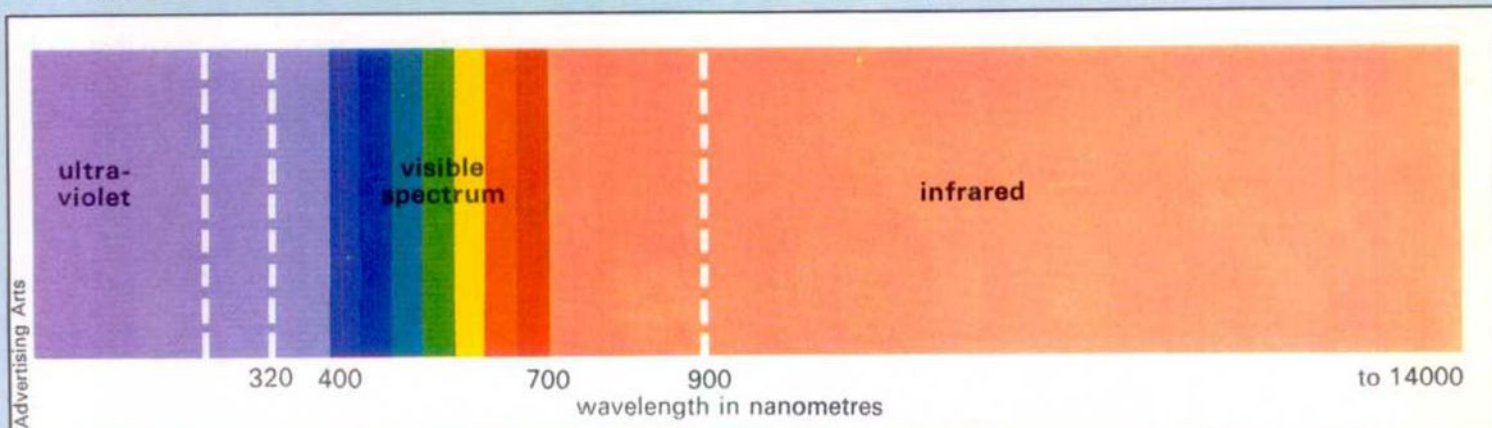
are *achromatic*, and are designed to bring all colours of visible light to virtually the same focus point. But UV and IR, being outside the normal range, have slightly different focus points.

Fortunately, most lenses have an infrared focusing index—usually a red line—on their focusing scale, to the shorter distance side of the normal mark, and the distance setting is transferred after visual focusing.

A special lens, called a *superachromat*, is corrected for the 400 to 1000 nm spectral region, and needs no refocusing even for infrared work. Aerial camera lenses are also infrared corrected. Mirrors do not disperse light as do refracting lenses, so a pure mirror lens, called a *catoptric* system, would need no focus corrections for UV or IR work. But all photographic mirror lenses also use some refracting elements as well (and are known as *catadioptric* lenses) and so still need some refocusing.

For UV work, the IR index mark may be usable—because of the way the lenses are designed. If it is not usable, a focusing correction for various distances must be established by trial and error.

Spectrum *Ultraviolet and infrared are regions of electromagnetic radiation either side of visible light*



Sources

Sunlight is a plentiful source of both UV and IR, though the proportion of either of these in sunlight is only small compared to the visible light output. The curve of the continuous spectrum on page 199 shows the relative proportions in sunlight of each wave length. Electronic flash has a similar UV proportion, while mercury vapour and fluorescent lights also emit UV. Incandescent (hot) lamps, such as photofloods and flash bulbs, are poor sources as most of their energy is given out in the visible and IR regions.

Sources of infrared radiation include the sun, electronic flash, and all forms of incandescent source such as studio lights. All are useful, to varying degrees, for photography in infrared light.

When no visible light is wanted, filters must be used which transmit only IR or UV. Ultraviolet transmitting filters are made of a special type of glass—Wood's Glass—

which is opaque. As ordinary glass absorbs UV below about 300 nm, lenses for UV use must also be made of a special material, such as fused silica (a form of quartz), calcium fluoride or fluorite, which transmit to 200 and 185 nm respectively. Such lenses are very expensive—an example is the Zeiss UV Sonnar 105 mm f/4.3, which can also be used for visible light photography.

Filters for infrared work—not to be confused with heat filters, which absorb IR—are fairly easy to obtain through normal dealers. A Wratten 87 filter is visually opaque but transmits IR, for example. Such a filter may be used over the light source, for photography in the dark without alerting the subject. In this case there is no need for a filter over the camera, unless there are light sources in the field of view which might otherwise drown out the infrared image. Alternatively, it can be used on the camera during daylight, so as to restrict the image to the infrared.

Since such filters are opaque they do not allow an SLR viewfinder to be used. An alternative is therefore a Wratten 25, which passes some deep red light and allows reflex viewing.

Use of UV and IR

Ultraviolet photography has various applications in forensic science and medicine, but the high cost of the special order lenses rules it out for most amateurs. Infrared photography, however, needs relatively inexpensive films and filters.

Aerial IR An oil slick records as green, while vegetation appears red



Howard Sochurek/John Hilleison Agency



Tina Carr

White trees Black and white infrared film is very grainy and has odd tonal effects

As well as its uses at night, for surveillance or wildlife photography, infrared is useful, for example, to penetrate haze that is visually opaque. This is because the wavelength of visible light is of the same order of size as molecules and fine particles in the air, whereas infrared wavelengths are longer. In the same way, a tractor with large wheels can easily cross a ploughed field, whereas a car with wheels the same

size as the furrows would soon get stuck.

Many photographers also use infrared film for its rendering of colours. In black and white, vegetation appears white while blue sky and water appears black. On false colour infrared film, all colours are represented differently, with vegetation appearing red, for example.

Odd colour The strange colour change with IR film can produce effects which are either bizarre—pink sky and green skin—or simply attractive, like the tulips



Neill Menneer

World of photography

Alain le Garsmeur

Photojournalist Alain le Garsmeur has travelled the world from China to Nicaragua and taken thousands of pictures ranging from topical news stories to photoessays on the way people live

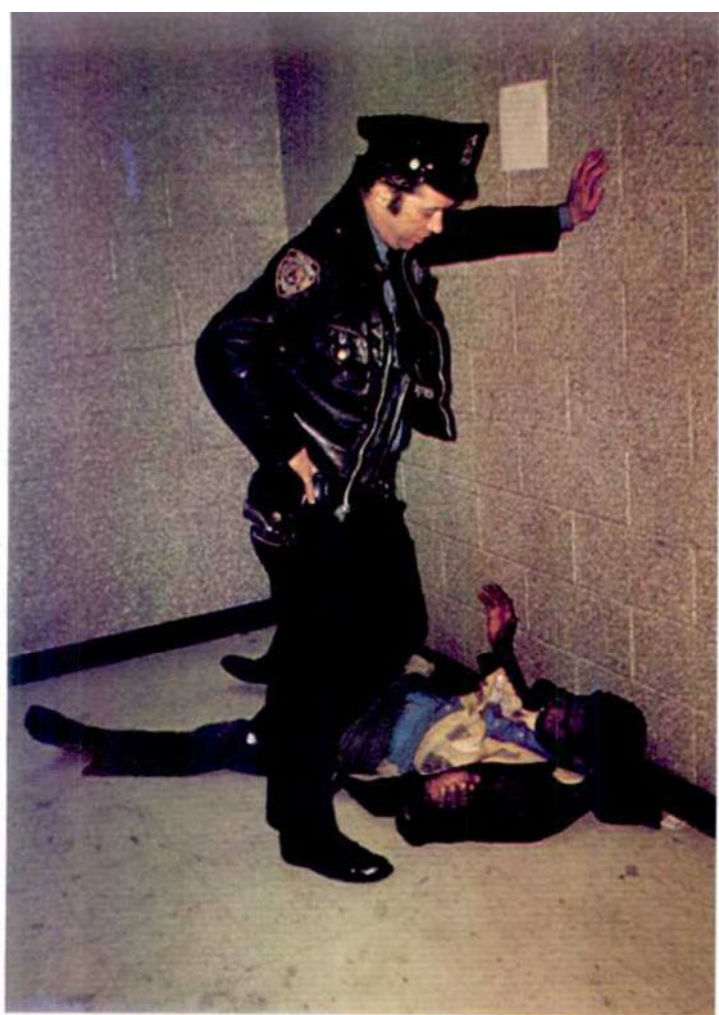
It is night-time in Harlem and two tough New York policemen are 'questioning' a suspect lying on the floor of a cell. Without any interruption, a photographer slips into the cell and take a picture. The police continue and so does the photographer. He takes a couple more with a flash and, not wishing to push his luck, leaves as quietly as he entered. Immediately he removes the film and mixes it with others in his camera bag.

Those shocking pictures appeared full page in a colour magazine and were

sold to a German magazine to form the basis of an investigative feature. The quiet man with the camera was Alain Le Garsmeur, and the pictures were more than lucky shots, for Alain is a leading photojournalist. His pictures capture a story, bring it forcefully to the public eye—and keep it there. 'Photojournalism,' he says, 'can be instantly seen and read and looked at, and then looked at again.' This makes it in many ways more powerful than either movie film or conventional reporting because the image lingers in the mind.

Alain took those shots while on assignment covering crime in Harlem for a British Sunday newspaper, *The Observer*. For the past three years he has worked almost exclusively for this paper, and his work appeared regularly in *The Sunday Times* for seven years before. He now spends at least four months in every year abroad, bringing back records of scenes and situations which shape our view of the world. Most trips last two to three weeks, during which he must get the essence of the story. 'You've got to come back with something good, and something different as well.' Colour magazines make tough demands on their photographers: 'They want brilliance, but with reliability.'





New York police
Alain once spent a week with police from a tough district of New York. He saw unusual 'questioning' tactics and many other interesting confrontations



Islands and decided in his late teens to become a photographer. After two years of a three year course at college in London, however, Alain's tutors told him he would never make a successful photographer. This, he believes, is because his college was, as Alain describes it, 'old style', and he was more interested in newer styles of photography. Alain's answer to these discouraging beginnings was to leave the course. He decided to continue his education in a more practical way—by working as an assistant to recognized and successful photographers.

During the 1960s Alain worked for Donald Silverstein, whose clients included the major international advertising agencies with bases in London. He also worked for Helmut Newton and Guy Bourdin in France, both men with prestigious reputations as leading fashion and editorial photographers.

To both Newton and Bourdin, thinking about equipment was very much secondary to the idea of the final photograph. It was the subject—what they could get out of it and what they could do with it—that mattered. Alain still works with this belief that equipment should be kept as simple as possible and that in the long run it is the final image that counts, rather than technical considerations about film speed and grain.

Of his advertising experience, Alain maintains that artistically it was no influence at all. From it he learned discipline and acquired an ability to handle people in difficult situations. 'In advertising, you are working to a very strict layout. You are also normally working with people so you have to be very organized; and since you are always working with deadlines, you must be very exact.'

Alain moved into photojournalism gradually. He was a freelance advertising photographer when *The Sunday Times* first used him for a job, which was to take a picture of a painting. One assignment led to another and gradually his editorial jobs for *The Sunday Times* completely outnumbered his advertising commissions. Eventually, he worked



Some of Alain's most memorable shots were of the Great Wall of China, but his preference is for semi-political stories.

A photojournalist covering political events or investigating political movements needs quite special qualities in addition to talent as a photographer. He must be brave enough to risk injury to get the best action shots, ruthless about doing something which may provoke those around him, already in a state of mind to outwit the authorities. Time and again Alain has proved he has all these.

Demonstrations are among his more difficult assignments and perfectly illustrate the tough conditions of political photojournalism. The photographer must bear the brunt of deterrents meant for demonstrators but he cannot leave the fray. Alain describes with horror an anti-nuclear demonstration in Brittany when French riot police moved in: 'I was getting gassed all the time, and when you're retching it's pretty hard to take pictures.' On another foreign assignment he was arrested in Nicaragua on suspicion of being an American spy and even Britain's Special Branch have taken an interest in some of his features.

Knowing that this is the life Alain chooses and loves, it comes as a surprise to find that his training ground for photography was in the glossy world of fashion and advertising.

Alain was brought up in the Channel

Traffic hazards The bold characters in this Chinese poster warn against the dangers of busy traffic and contribute to an amusing shot



Alain le Garsmeur/Observer Magazine

exclusively for *The Sunday Times*. In the mid 1970s Alain moved from working for *The Sunday Times* to *The Observer*, where he has since had the opportunity to work on larger features for the colour magazine, rather than single picture assignments.

As a photojournalist, Alain sees himself as a cross between a news photographer and a compiler of photographic essays. News photographers often work to very tight briefs. They must rush to their assignments, often at very short notice, and come back quickly, usually with pictures showing particular events or people in the news. Photoessays, however, are usually more personal in nature and may be compiled over a period of months, often on subjects with no connection with topical new items.

Some photoessays are for editorial features while some are more directly connected with events in the news. One day he might be illustrating an article about poetry and landscape, the next week covering a revolution.

The ideas for stories usually come from the editor of the magazine. Though he works on a freelance basis, Alain does become interested in the magazine and so from time to time he makes his own suggestions about subjects to cover. If he is given an assignment abroad, Alain usually has a few weeks to prepare for

the job. During this time he tries to plan as much as he can in advance and reads about his subject so that he has some understanding of the place and the people when he arrives.

Sometimes when he travels, Alain goes with the journalist who will write the story that goes with the pictures. Their ideas about a subject may influence each other while they work on a job. Often Alain finds a photographer and journalist can help each other by working together. If, for instance, someone fairly

Californian railway station Taken on assignment touring the United States by train

nervous is being photographed, it can help if he is being interviewed at the same time. The attentions of the journalist distract the subject from the photographer and this can also work the other way around.

When he is abroad the pace can be very fast. 'You work incredibly hard', he says. 'You have to just go in and out.'



Heat in Harlem The ravages of arson in New York during the late 1970s produced some dramatic material

Alain le Garsmeur/Camera Press Ltd.

Telephone calls to make contacts are done early in the morning and the rest of the day is spent 'chasing up' the story. 'You can't hang about. Even though the light may not be quite right, you have to grab the opportunity to take a picture when it comes.

One difficult assignment was to portray members of the Ulster Defence Association, a paramilitary group, in their homes. 'It was very tense and delicate,' Alain explains. 'Since they are in a very vulnerable position politically, there was always a degree of suspicion. We had to do a lot of talking to them, and had to work very carefully so as not to upset anybody.' Because the photographs were being taken in their own homes they could refuse to be photographed at any time, spoiling the whole feature.

Photographing people is a large and important part of the work of a photojournalist. Often, it is a person's expression that conveys most powerfully what

Alain le Garsmeur/Camera Press Ltd.



Peat digger Alain found this peaceful image in the Irish countryside

Russian newlyweds This picture came out of a trip to Moscow. The couple were having their own impromptu wedding celebrations



is going on in a situation. This can be very difficult, particularly if the subject does not want to be photographed or if the situation is politically or emotionally charged. Taking a picture might create an even greater tension, especially during a riot or at a death. Many photographers do not like taking such pictures. 'I have no qualms about it,' Alain says. 'I sometimes feel slightly embarrassed by taking the picture because sometimes you're embarrassing the whole situation by doing so. But if it is important to the feature, I'll take the picture.' He is careful about trespassing but 'if I ask a chap and he asks me not to take his picture and I'm in a public place, I'll take it.'

A photojournalist like Alain must be very careful how he approaches people.

For the Ulster Defence Association story, he made contact with his subjects through a journalist friend working in Ulster. When he went to New York to cover crime in Harlem, he approached the police directly and found them very helpful. As an accredited press photographer, he was allowed to spend a week travelling with policemen round some of the roughest districts of New York, though the most famous shots from this visit were taken inside the police station itself.

Not all authorities that Alain has met have been as cooperative as the New York Police Department. When he went to Poland in 1979, before the growth of the Solidarity union and changes in attitudes towards foreign journalists, arrangements for his visit had to be made through the Polish state press agency and these included an agreement as to how many films he would take with him. After visiting a number of officially

Alain le Garsmeur/Observer Magazine

recommended sights Alain made contact with a dissident trade union activist. Through this one man, he was introduced to a variety of students and workers who had criticisms of the state. After getting in contact with this dissident group, Alain discovered he was being followed wherever he went by two cars each containing four men looking very much like everyone's idea of secret policemen. Five minutes after he turned out his hotel light at night, the light in the room next door would go out.

On one occasion when he was being shown round a town by a group of students he noticed a different car following the car he was in. Only when Alain got out of his car and was walking across the road did he notice a strange piece of machinery clamped to the outside of the other car. It was not until he looked straight at the unusual gadget

that he realized that it was a camera—and that it had just taken his picture. Apparently such roving cameras are used mostly by the traffic police.

It was not long before gentlemen from the state press agency called on Alain in his hotel. He was reminded that he needed a permit from them in order to take his films out of the country. Alain could hardly deny that he had been meeting people not on the officially recommended list for foreign journalists. He managed to strike a bargain with his hosts to the effect that he would only take out of the country those films exposed while on officially approved visits. Alain had to leave behind 40 exposed films. What the Polish authorities did not know until they processed the films was that they were all exposed in Alain's hotel room on his last night in the country.

Alain carries as little equipment as

possible, but this still means taking three Nikon bodies wherever he goes, two F2ASs and an F as a back-up. He uses five lenses ranging from 24 mm up to 180 mm, and he also carries a tele-converter to double the focal length of any of his lenses. Alain's favourite film is Kodachrome 64, but in poor light he will use Ektachrome 400.

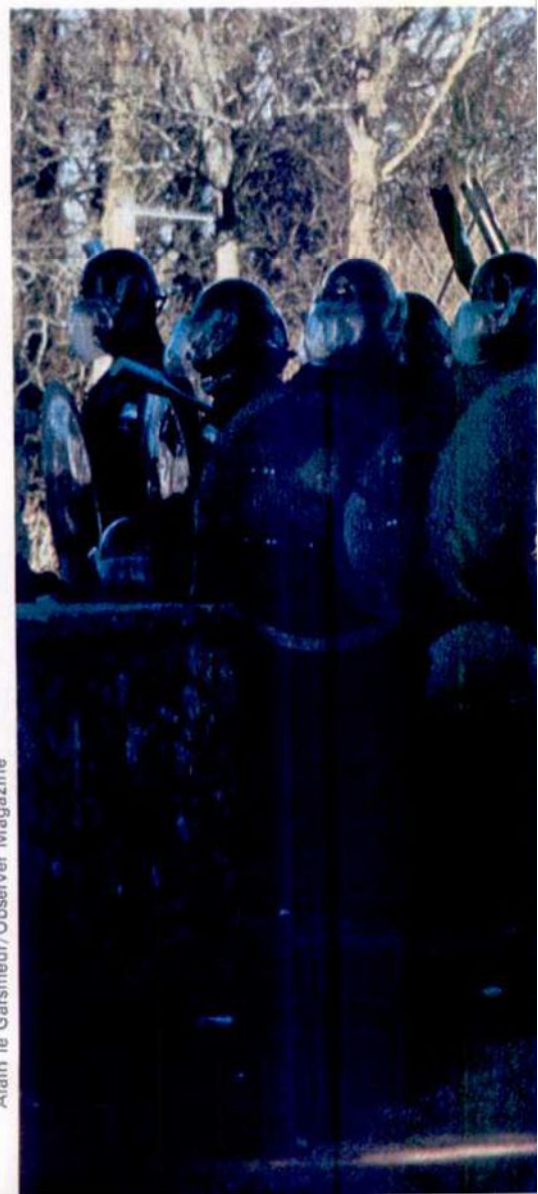
On a two week assignment Alain will often use 100 rolls of film. He takes as many pictures as possible and leaves the editing until the job is done. His material all has to be well exposed and usable. It also has to have an original feel to it. A freelance photographer's job may sometimes be exciting, but it is not a very secure way of life. As Alain says 'You have to do that little bit extra to keep you ahead of the competition. Each job you do you have to work harder, because you're only as good as your last job.'



Candid comrades These Chinese soldiers were being photographed by a comrade in Peking as well as by Alain

Great Wall On his Chinese tour Alain climbed to the top of a hill for this dramatic panorama of a famous site

Riot police Like soldiers from a bygone age—French riot police confronting anti-nuclear protestors



Alain le Garsmeur/Observer Magazine





Choosing instant cameras

Instant cameras can be fun to use and have a number of advantages over conventional equipment

Press the button on an instant picture camera, and a minute later you have a fully developed print. Any mistakes you make can be put right straight away with a second shot, so instant photography is both enjoyable and easy. And you can show your subject the picture on the spot for an instant reaction.

A great advantage of instant picture cameras is that they are simple to operate. Even the more sophisticated models do not need exposure meters or a knowledge of normal camera controls. The majority are bought by amateurs who use them for snapshots, family pictures, shots of friends, parties, and so on—and so the cameras tend to be cheap and stylish, though more expensive and versatile models are available.

Simplicity and speed make instant photography very attractive to those people who do not want to bother with the technicalities of more expensive equipment. But it is also useful to serious amateurs and professionals for test shots and visual notebooks.

One disadvantage of instant photography is that, with a few unusual exceptions, you can have only one print per shot. You cannot instantly make identical prints unless the subject is completely static, allowing more than one shot. Should extra copies be required, print copying services are available. But these involve a similar wait to having prints made from nega-

tives, at a slightly higher cost, and lower quality.

Another disadvantage is that because the print is made in the camera, either the equipment is bulky compared with the average simple camera, or the print size is rather small.

There is not a wide range of different film types available for use with each camera, and the film types are not interchangeable between cameras. At most, you will have a choice of either black and white or colour film packs designed for use with your camera.

Instant film systems were pioneered by Polaroid in the US. The company had built its reputation on the manufacture of polarizing material, but the cameras make no use of this material. The inventor of the original system was Dr Edwin H. Land, so Polaroid cameras are sometimes called Land cameras. When Polaroid brought out their SX-70 dry film system, Kodak entered the market with a film and camera with similar properties.

Instant picture frames

As each camera is designed to use a specific type of film it is important to

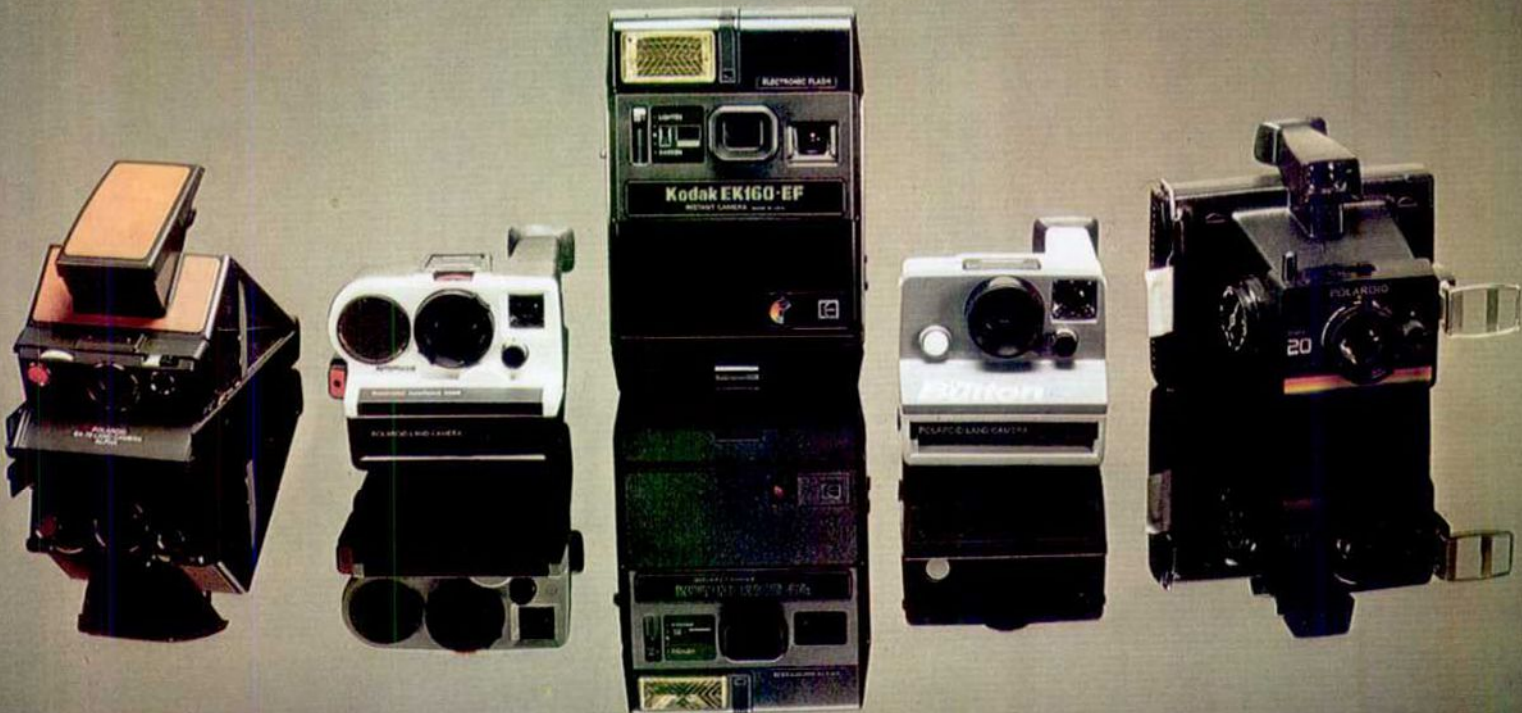
Instant cameras The range available includes (from left to right) a folding SLR, an autofocus camera, one with built-in flash, a simple Polaroid and a peel-apart-film type

understand the differences between the two basic film systems. The older peel-apart film is produced by Polaroid alone, and the more modern dry or integral film packs are manufactured by both Polaroid and Kodak for their own systems.

The peel-apart type involves pulling a tab once the picture has been taken. This squeezes the two layers of the film together, with viscous chemicals between them. After a set time—usually a minute—at room temperature, the two layers are peeled apart to reveal the picture. One layer is in fact a negative, but in most film packs this is useless and must be thrown away. Some cameras take black and white films which yield a negative which can be used conventionally in an enlarger to make further prints.

Once the layers are peeled apart, the print is left to dry. For a permanent print, the surface must be lacquered. When handling this type of film you must be very careful, especially when children are present, for chemicals on the print and the disposable layer are not only sticky and unpleasant but contain a strong alkali which is poisonous and may burn your skin.

The newer type of film is a single dry film pack, in systems made by both Polaroid and Kodak. The chemicals are sealed within the print material, which is thicker than normal. All processing takes





Simon de Courcy Wheeler

Peel-apart film Polaroid backs for medium format cameras and some older instant picture cameras use rather messy film that must be peeled apart

place within this enclosed space and the chemicals are neutralized after development. The image needs no lacquer and is permanent. The design of this kind of film is much more complex but more reliable than peel-apart film. You do not have to time the development, as you do with the older type, as processing stops automatically. Furthermore, the temperature does not matter as much. However, the cost of this type of film is much greater. In both the Polaroid and Kodak systems, as soon as the picture has been taken the print is ejected from the camera automatically. Within a few seconds the picture begins to appear, and in a matter of minutes the colour print is fully developed.

One advantage of Polaroid dry film over the Kodak equivalent is that the batteries which power the motorized film ejection system are contained within the film packs themselves. As they will handle far more than the ten shots in each pack, there is no chance of running out of power. The Kodak system uses separate batteries in the camera.

There are important differences between instant film (of either type) and

normal print film. Because the print is made directly, there is no way of adjusting for slight exposure errors as you can when developing and printing normal films. All that you can do is to make corrections on the camera's light-to-dark control for a second shot. To minimize errors, the makers ensure that the film is not too contrasty. This results in softer tones, weaker colours and less 'brilliance' than conventional prints.

Instant pictures have an appearance of their own, though some people do not like the colours in them compared with normal slides or prints. The manufacturers aim for good skin tones by flash, and often the colour under these conditions will be better than with normal film.

Exposing the film

Exposure, with most instant cameras, is automatic. Some models use a fixed aperture, some give a choice of two apertures (usually represented by weather symbols), and others use a range

of apertures, linked to the shutter speeds to form a programmed autoexposure system (see page 383). The shutter speeds are varied to give the correct exposure, and can be as long as 14 seconds on the more sophisticated cameras. The fastest shutter speeds, however, are often rather slow compared with those on conventional cameras. The popular dry film cameras have top speeds as slow as 1/125 and even 1/80, though the Kodak cameras are better than the Polaroid ones in this respect. Peel-apart film is more sensitive to light than dry film, and some cameras using it have top speeds of up to 1/500.

The light-dark control (which with Polaroid cameras can change the exposure by up to three stops) is the only way of manually modifying the expos-

Pop out film Some cameras have little motors that push out the film after you take the picture. The image then develops itself automatically and there is no negative to peel back

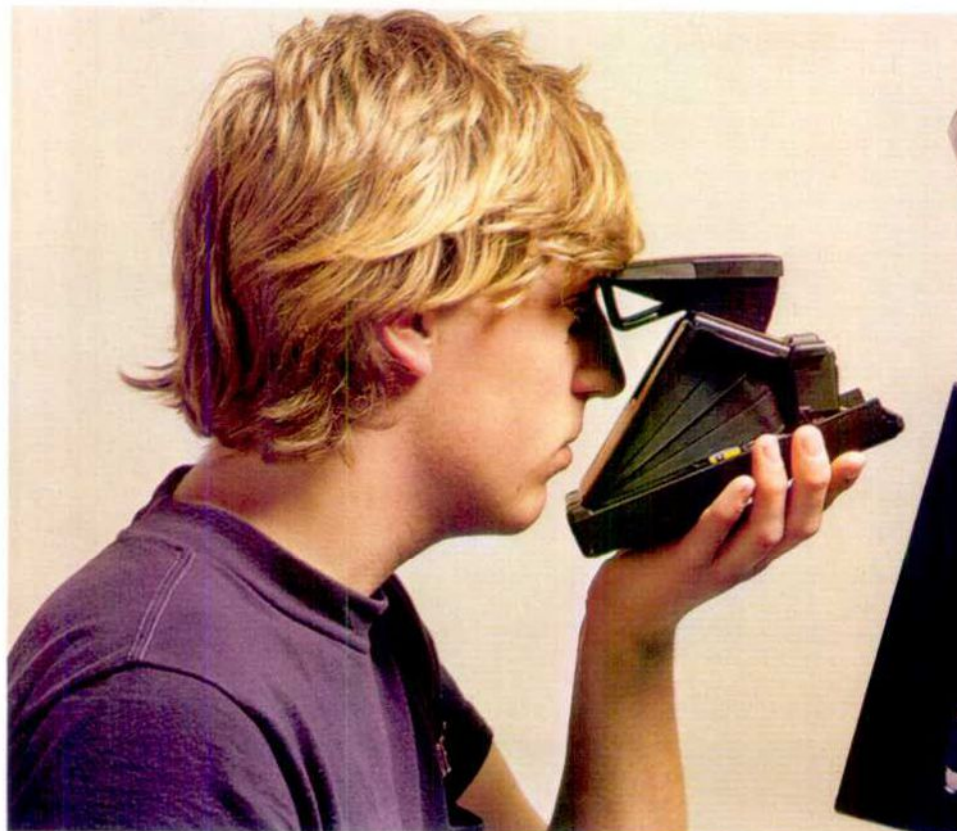


Simon de Courcy Wheeler

Holiday snaps

Instant pictures are ideal for give-away snaps or pre-testing composition





Big films Film has to be the same size as the print so instant cameras are often bulky

sure on automatic cameras. It alters the camera's aperture, rather than the shutter speed, so it can be used with the built-in or specially made flashguns and flashbars. The increasing availability of electronic flashguns to fit these cameras has greatly reduced the cost of instant photography.

Focusing and framing

Most of the cheaper cameras have a fixed lens set for around two to three metres, relying on depth of field to get subjects at other distances reasonably sharp. Some models, whose lenses are not fixed, feature rangefinders or zone focusing (using symbols). There are also some cameras, including the top Polaroid models, which have automatic focusing.

Although there are no interchangeable lenses as such, some Polaroid cameras can be fitted with converter lenses and close-up attachments, which alter the flash as well as the focus.

Viewfinders are normally of the direct vision type, occasionally with the addition of a bright-line frame. A few more professional models have rangefinders, and the top Polaroids are big format single lens reflexes. However, even with the reflex cameras, the finders are not as clear or easy to use as normal 35 mm SLR finders. With the cheaper cameras, the finders may be little better than the sort found on the cheapest conventional 110 models.

Bulk and accessories

Some Polaroid models, mainly the SLRs, have the advantage of folding flat, making them more convenient to carry. The other instant picture cameras, notably the Kodak models, are very

bulky. Many professionals take an instant camera with them when they search for locations, or on the actual shoot. They are used to keep a record of the site, to give prints to models, and so on. The camera must take up as little space as possible in the outfit case, and so the folding Polaroid models are ideal.

The availability of accessories is extremely variable and depends on the specific model. The only accessories available for most instant cameras are neckstraps and flash units. Some better models, however, also accept special cable releases, tripod adaptors, self timers, and cases.

Professional use

The ability to see a print almost immediately has resulted in professionals using instant picture film to test lighting setups and effects. However, most instant picture cameras are not suitable for this purpose because of their automatic exposure systems. Therefore, special Polaroid backs are available which are designed to fit such models as 10 x 8 and 4 x 5 inch studio cameras, and Bronica, Hasselblad, Mamiya, and Rollei SL66 and SLX models. Most instant picture backs use peel-apart films as they are closer to normal films in terms of colour, contrast and exposure than the dry types. Nevertheless, the result can only be used as a rough guide.

There are also a couple of Polaroid professional rangefinder press cameras (originally the Mamiya Press models) which feature interchangeable lenses. These cameras have manual shutter speed and aperture controls. One model, the 600, will take only Polaroid film, but the more expensive 600SE also accepts conventional rollfilm.

The choice

In many cases, the choice of camera will be determined by the type of film you want to use, which in turn will be determined by cost. The simpler cameras are often low price models designed to attract people to the system. The main cost of using instant pictures is in the film packs, and the most basic cameras in each range are effectively 'loss leaders'—units with little profitability but whose low price encourages many people to purchase one, with the likelihood of large sales of film. Such cameras are therefore ideal for casual use. If you want to take a lot of instant pictures,



however, the cost of the equipment will eventually be completely outweighed by the cost of materials, and so justify a greater outlay on the camera.

Instant pictures typically cost between twice and three times as much as conventional enprints, the peel-apart variety being the cheaper.

You must decide how sophisticated you need the camera to be—whether you want auto focus facility, reflex viewing, larger prints, and so on. To get anything like the versatility of the 35 mm SLR you must pay a lot for your camera, sometimes almost as much as the conventional model itself. The simple cameras are mainly intended to take pictures, in sunlight or with flash, at distances of two to three metres. If you want your camera to do any more than this, your choice will be more limited,

and more expensive. Many people choose cameras using dry film because it is more convenient, with no waste paper or messy chemicals. And the final factor is the size of the camera.

There are two main reasons for a serious photographer owning an instant camera—as an addition to a normal camera outfit, and for sheer enjoyment. Even considering the high cost per print it is not an expensive pleasure. Carrying an instant camera allows the photographer to give people prints to thank them for helping with normal shots

(which could be slides they will never see). The simple cameras work well and, unless you pay a great deal, there is little difference between the models. An instant camera is worth considering and fun to use when you get one. They are ideal for party snaps and quick pictures which record the occasion and can immediately be given away to friends. Instant picture cameras are also very useful if you want to check on the composition of a shot and need an immediate result before taking the 'proper' picture with a conventional camera.

Comparison
Instant pictures
are smaller and
have less subtle
colours than
enprints



Not compact
A 35 mm camera
(left) looks tiny
beside an instant
camera



Assignment

Along the coast

Even the most spectacular coastline, if approached with thought and care, has much more to offer the photographer than shots of sea and sand

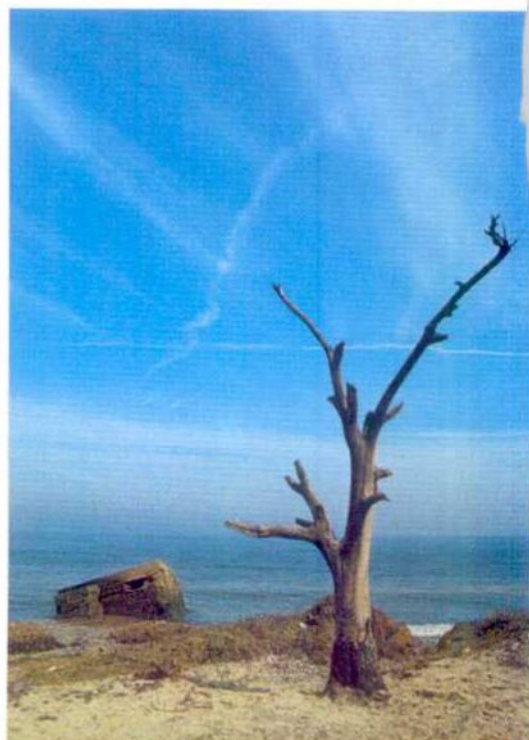
Covering a large area of ground with your camera does not necessarily mean that you will produce a better or more varied set of pictures on a particular theme. With landscapes or seascapes, concentration on a limited area which you know well can yield better results.

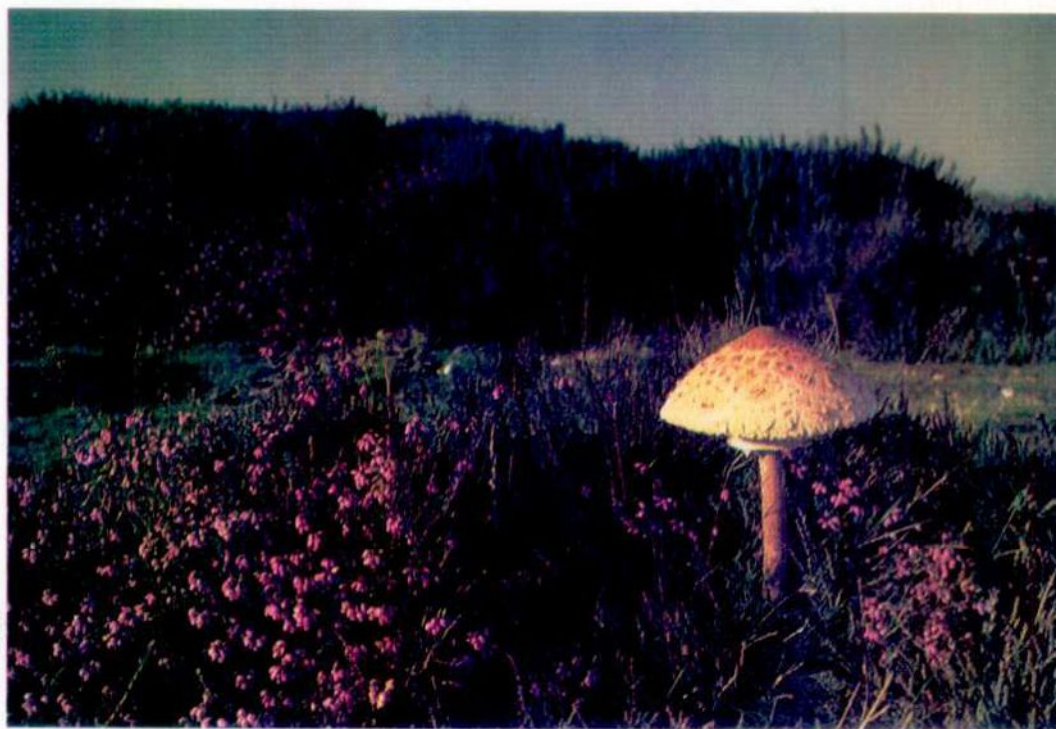
Trevor Wood has lived near this particular section of coastline for a number of years and by now he is familiar with almost every step of a half hour walk which he regularly takes along the coastal path. Many people who have similar close contact with a particular area eventually find fascinating details which were not apparent at first. By now Trevor knows exactly where the best shots are taken along this route and the best time of day to take them. For this

assignment he was careful to wait for a bright, clear day—once he had this advantage, it was no problem to go to the spots he knows so well and spend a day taking the photographs shown here.

Using a vast range of equipment does not appeal to Trevor and, whenever possible, he prefers to work with the bare minimum of cameras and lenses. Knowing that the wide open flat areas are well suited to wide angle lenses, he took most of these shots with a 24 mm lens and an Olympus OM2, but 21 mm and 50 mm lenses were also used occasionally.

Unlike many photographers, who use Kodachrome whenever possible, Trevor prefers to use Ektachrome 64 and has established a good working relationship





Trevor Wood

Estuary Too often, sunsets make dull photographs, but for this shot Trevor exposed carefully for the boats to give foreground interest to the scene

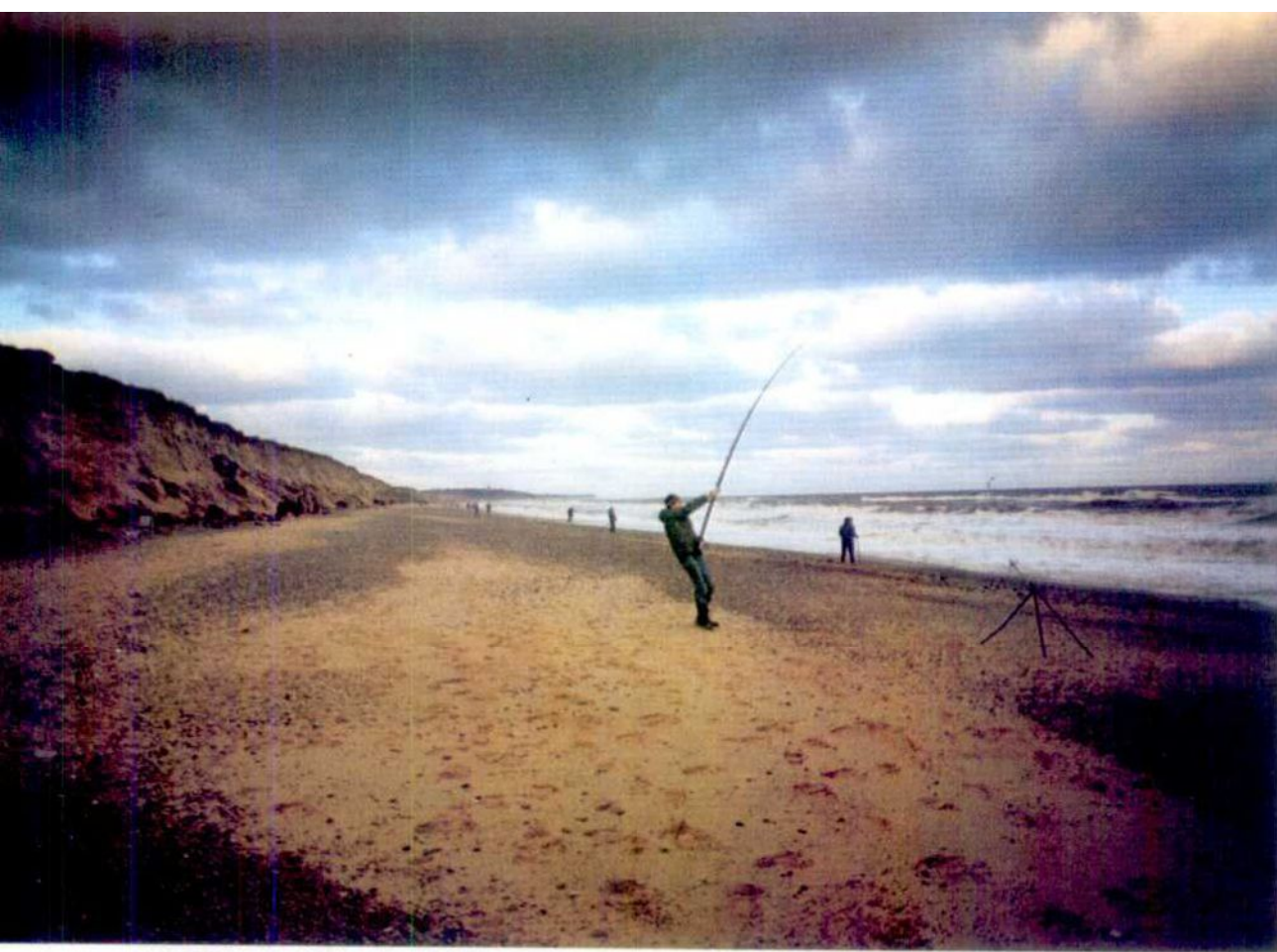
Tree and bunker Here the withered tree and the derelict bunker contrast well with the sea, the bright blue sky and the fine wispy clouds

Coastal view In bright, clear dawn light a weak graduated neutral density filter brings out the colour in the morning sky

Mushroom This detail caught Trevor's attention. To get the best viewpoint, he lay down in the heather and used a 21 mm wide angle lens

Bunker Trevor also tried approaching the subject in a different way—this time leaving out the tree. Both versions resulted in attractive images





with a nearby lab that knows exactly the sort of results he wants. For the black and white shots, he used Kodak Tri-X.

Although some of the shots were taken during the early morning, Trevor prefers the light of late afternoon and early evening and much of his work is done around this time of the day. Although he only uses filters when absolutely necessary, he did fit a graduated neutral density filter to add interest to the sky

Anglers Here, the shot benefits from the action in the scene. The early morning sky adds attractive colour and backlights the figure and his bending fishing rod

Fishing boats During an overcast spell in the afternoon, Trevor loaded a roll of black and white in his camera. The low viewpoint emphasizes the shapes of the boats

Weathered trees To get a shot that showed the barren landscape, Trevor used a wide lens and framed the trees so their shapes showed up against the sky



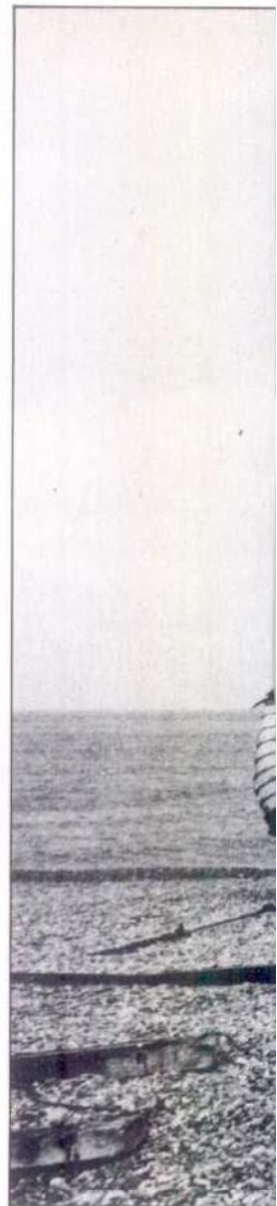
when there was little there in the way of clouds or natural colour.

The subjects Trevor chose were not all panoramic views so often associated with landscape photography. Many of his shots concentrated more on details—the low wide angle shots of a mushroom, or the fishing boats lying on the beach.

Trevor is rarely satisfied with a single approach to a subject, and the occasions are rare when he sees something, photographs it and moves on. More often, he looks at his subjects from different angles and distances, carefully choosing the right lens and camera position, and only then takes the shot.

One aspect of this particular coastline which makes it particularly interesting for Trevor, is that the land is rapidly being eroded by the sea. This means that the scene is constantly changing and that, in a few years, the stretches of coastline Trevor has photographed will have vanished forever.

Erosion Knowing that these cliff edges would soon collapse and disappear Trevor made this atmospheric study. The low light level of early evening brought out texture in the ground







Darkroom

Additive colour prints

If colour work and special techniques appeal to you—or if subtractive colour printing looks too complicated—then try additive printing



John Ward

Although colour printing by the *subtractive* method (see pages 590 to 593) is quick and straightforward and generally gives good results, it can be expensive to set up your darkroom with the necessary equipment. If you want to make colour prints but cannot afford to buy all the necessary apparatus, you can use the *additive* or *tricolour* printing method which needs just three extra filters.

The difference between subtractive and additive printing lies in the filtration. For the subtractive method, colour balance is adjusted by using different combinations of filters in the complementary colours. For additive printing, correct colour balance is achieved by making three separate exposures through a single filter in each of the three primary colours—blue, green and red. The exposure through the blue filter forms a yellow image in the print, exposure through the green filter forms a magenta image and exposure through the red filter forms a cyan image. These three images combine to show a range of colours close to the original subject. By varying the exposure times through each filter, you can adjust the density of each image to give the correct colour balance. So instead of buying a whole range of filters, you need just three—Wratten filters 98, 99 and 25, for example. Since only one filter is used at a time, you do not even have to have an enlarger with a filter drawer—the filter can simply be held beneath the lens.

Of course, the method has drawbacks. The test print procedure is far more drawn out and complicated and you may have to make numerous tests before you achieve the right colour balance.

Additive colour Full colour balance is obtained simply by varying the length of exposure through the three primary colour filters. Here, the exposure combination needed was $6B + 10G + 20R$

The need to make three separate exposures for each full print also adds to the rather tedious nature of the method and makes special shading or burning-in very difficult.

Setting up

Filters for additive printing can be used either in a filter drawer or placed directly beneath the lens. If you intend to use the filters beneath the lens, it is worth making a cradle to support them. A filter cradle like those used for variable contrast filters in black and white printing (see page 425) is ideal. You can cut your colour filters to size, possibly mounting them in holders for long term use.

Alternatively, you can construct a rotating disc arrangement which, like the cradle, is clamped to the enlarger lens or swing filter stalk. The required filters are contained within this disc, and simply rotated to a position below the lens when and as required. A device like this was once commercially available and you may therefore be able to buy one if you look around.

Be careful when you are handling the filters not to touch anything but the very

Additive principle Like the Philips enlargers, this very sophisticated automatic model gives three simultaneous exposures through blue, green and red filters

edges, particularly if the filters are to be held below the lens—because fingerprints can diffuse the image. You could tape handling flaps to the filters to reduce the chances of marking the all-important central part of the filters.

Always lay the filters flat on a clean antistatic lens cleaning cloth placed conveniently close to the enlarger but out of harms way. After the printing session, carefully interleave the three filters in folds of clean notepaper and put them safely away. This routine should prevent filters from getting scratched and grubby through use.

Fogging is a real danger with additive printing because the printing paper is left unprotected for much longer than in other methods of colour printing. When setting up your enlarger, therefore, you should take special care to mask off any light leaks. It is also better to avoid using a safelight if at all possible. With no safelight, it can be difficult to identify the filters in the dark but they can be marked to aid recognition.

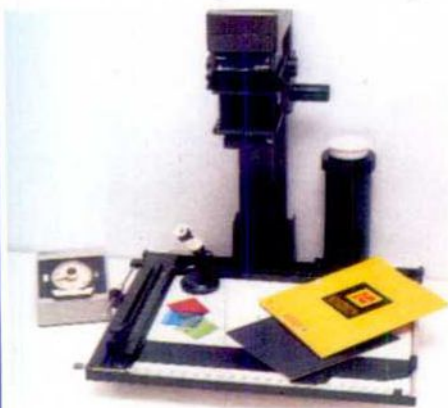
If you are using large filters held below the lens, you can cut small notches in the sides of each filter. In the dark you should be able to identify a filter's colour simply by running your finger along its edge.

You cannot hope to produce a successful print straight off and so you must make a few trial prints to get some idea of the filtration for a particular negative.



photo courtesy of Durst, Italy

Evaluating colour prints



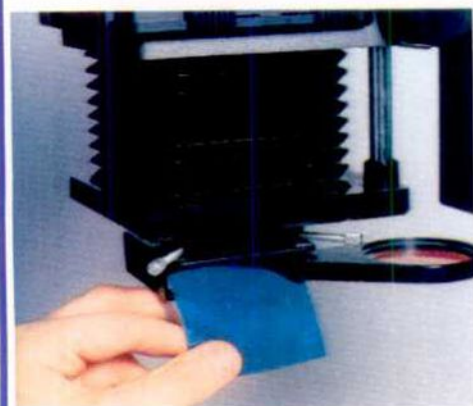
1 For additive printing, you need b & w printing equipment, some colour paper and one filter in each of the primary colours



2 Compose and focus the image as you would normally. A focusing aid ensures that your enlargements are always perfectly sharp



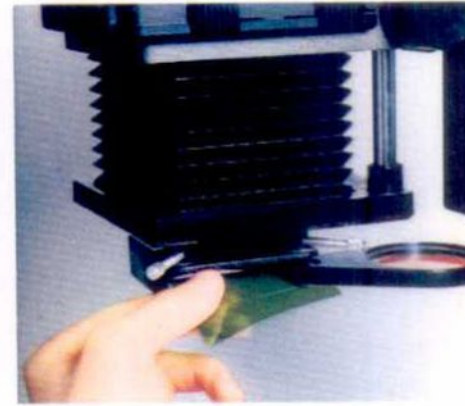
3 Stop the enlarger lens down to working aperture. For making test strips, however, you may find that a smaller aperture gives better control



4 Insert the blue filter into the filter tray of the enlarger, making sure that it fits snugly and covers the entire picture area



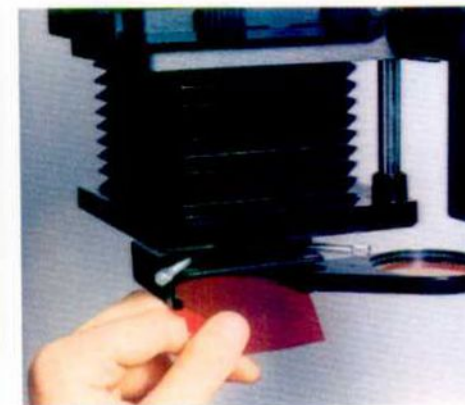
5 You are now ready to make the first exposure. Expose the entire print for 10 seconds. You may have to adjust this for a second test print



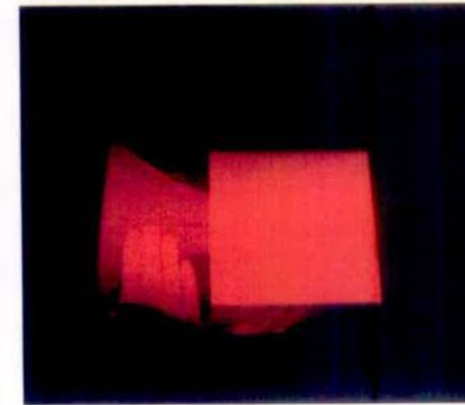
6 Remove the blue filter and insert the green one. It is important to make sure that your filters are always perfectly clean



7 Expose the green test strip in steps of 10, 20 and 40 seconds, moving the mask vertically along the easel, to give a series of horizontal strips



8 Take out the green filter and insert the red one. The exposure steps for the red test strip are the same as for the green one



9 Make the final test exposure, moving the mask horizontally across the easel. Be careful not to jolt the enlarger between each printing stage

For these trial prints, select a negative that is fairly typical of your work and includes a number of easily identifiable colours—ideally skin tones. Eventually you can build up a series of trial prints for a range of typical subjects which can act as a reference when making full prints from similar negatives.

Each trial print requires a separate

series of test exposures made in a special way. To make these test exposures, compose and focus the image on the baseboard, making sure that the area of the print selected for the test is representative of the picture. To keep exposure times short, use a fairly wide aperture— $f/4$ with a 75W lamp, for example, or $f/5.6$ for a 150W lamp.

Rather than making a quadrant test like that for subtractive printing, start the test by making a single exposure covering the whole print through the blue filter. This exposure should be about ten seconds, but you may have to use either a longer or shorter exposure for subsequent prints if the print is too dense or not dense enough.

Once the first exposure is over, exchange the blue filter for the green and produce three exposure steps across the print by covering with opaque card in the same way as for a conventional test print. The total exposure through the green filter should last 40 seconds. After ten seconds of this exposure, cover a third of the print with the card. After a further ten seconds, cover a further two thirds. Leave the remaining third uncovered for the rest of the exposure—20 seconds.

Once the exposure through the green filter is finished, replace it with the red and repeat the procedure, but make the three exposure steps at right angles to those for the green. The result is a grid of nine squares with different filter and exposure combinations.

Because the first few test prints may be breaking new ground for you, it may be

worth including two series of tests on each test print, simply varying the initial blue filter exposure to start with. Make a slightly smaller enlargement and mask off the oversized sheet of paper before completing one series of tests with a blue exposure of ten seconds. Then reposition the paper to make a second series with a blue exposure of 15 seconds. This will give you 18 filter and exposure combinations on each sheet.

It is important to keep notes of the exposures you make, particularly when these vary from the initial standard ten or five second time units. When writing down times, list exposures in the same order as they are given: blue (B), green (G) and red (R). One form in which a combination of exposures may be written is $10 + 10G + 10R$, which indicates a ten second exposure through each filter. Transfer this information to the back of

the trial print, once it has been processed and dried, to form a permanent record.

Process the print in exactly the way you are going to process the prints which follow, but wait until the print is completely dry before making any final assessment of density and colour.

When the print is dry, examine it in daylight or good room light and try to identify the grid square that gives the most correct colour balance. If none of the squares looks right and the print is too light in colour, repeat the test using a wider aperture or longer time unit. If it is too dark, close the lens down by one or two stops rather than shortening the time unit, unless you use a timer for accuracy.

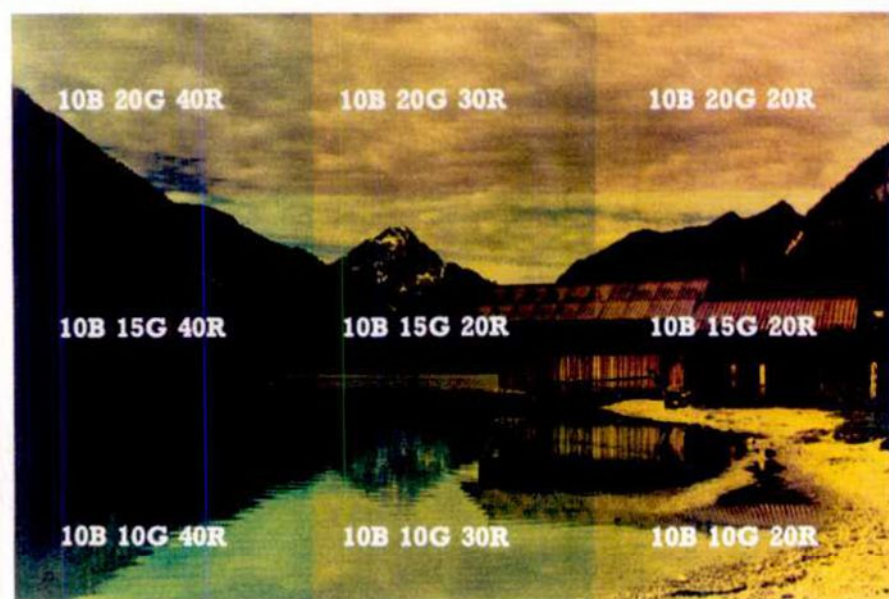
Some test prints may be too blue—and so lacking in yellow—and to rectify this, you must make another test using a longer exposure through the blue filter (15, 20 or even 25 seconds instead of 10).

To eliminate a cast in a primary colour, you have to increase exposure through that colour filter. Casts in the complementary colours are eliminated by reducing the exposure through the corresponding primary colour filter. A cyan cast, for example, is eliminated by reducing the exposure time through the red filter.

Eventually you should obtain a test print where one or two of the squares of the grid are fairly close to the correct density and colour balance. You can compare individual squares for clues on how to obtain full correction. If the correct colour balance appears to lie between squares given the exposures $15B + 10G + 10R$ and $15B + 20G + 20R$, the final correct exposure should be between 10 and 20G and 10 and 20R—an exposure combination of $15B + 15G + 15R$. All three exposures must be reduced or increased if the density you want falls between the values shown by the two closest squares on the test print. You can get an idea of the effect of exposure changes by comparing squares which have similar filter exposure proportions. A square which has received 20 seconds blue, 20 seconds green and 20 seconds red exposure ($20B + 20G + 20R$) can be checked directly against a square which has received $10B + 10G + 10R$ —50 per cent less exposure—or another which has received $15B + 15G + 15R$ —25 per cent less exposure.

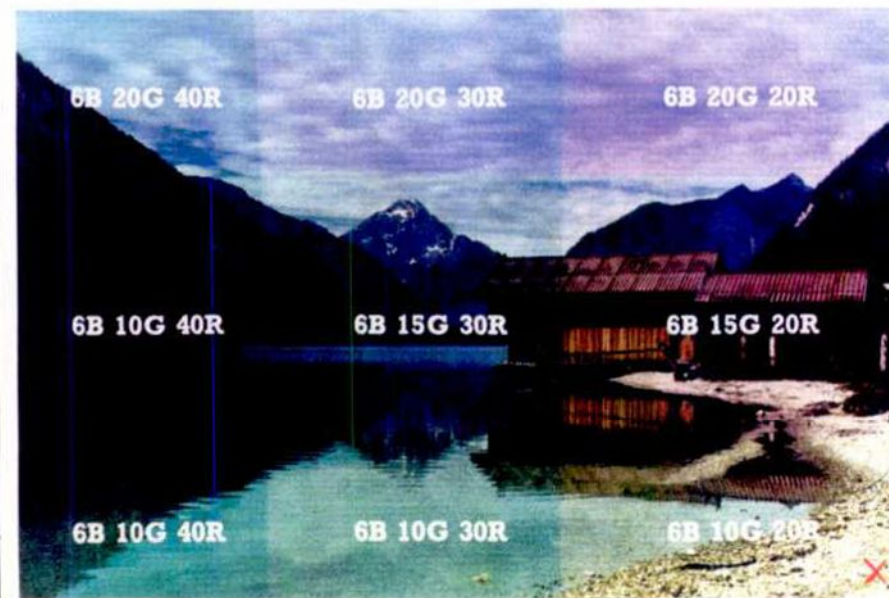
Keep thorough notes of your test print grids, particularly the one that displays something close to your final, correct filter exposure combination. The testing procedure is not something you have to do everytime, but it is worth making a set which covers all aspects of the various and different types of subject that you take most often.

When you have had some experience of additive printing you will find that you can make a seemingly infinite range of adjustment to colour balance by making small time changes to individual filter exposures.



Evaluating your test print After a few trial prints, your test prints should look like this. The grid of exposures above was obtained from 10 seconds blue plus up to 20 seconds green and

up to 40 seconds red. The print is generally too yellow, and so a second test was made reducing the blue. This corrects the yellow, and shows correct exposure at the bottom (X)





Weddings

Wedding photographs are frequently dull and formal and give only a hint of the full flavour of the event—but with a little thought and careful planning, you should be able to take a series of attractive shots

If you look at any family wedding album, you will see that the style of traditional wedding photography has changed very little over the years. Most couples, when planning a formal wedding, will hire a professional photographer to take pictures for an album that they will keep for the rest of their lives, and probably pass on to their children after them.

The official photographer has a difficult role to play—he must direct and organize people who may be nervous and preoccupied with such an important day, and probably not at their most cooperative, and he does not have a second chance to put things right if they turn out badly. So if the couple happen to ask you, as a friend, to take their official photographs, think twice before you accept. Mistakes on your part could ruin both the couple's day and your own—and at worst, you could lose your friends. Also remember that should your equipment fail, maybe without your knowledge, the blame will be on your shoulders and the couple will have no photographs at all. It is best to advise the couple to use an expert for the official coverage of the occasion, which will relieve you of a considerable responsibility and will not rob a professional of his livelihood. It will also allow you to concentrate on the more informal and creative photographs—aspects which are rarely in a professional's brief.

As quite often happens in such cases your friends may well find your informal pictures more natural and more interesting than the official version, and yours may be the photograph that is chosen to be framed for the mantelpiece, while the professional's pictures remain buried in a dusty album.

Whether you are taking your own informal pictures or have agreed to be the 'official' photographer, as a friend you have the tremendous advantage over a professional of knowing the couple concerned, and perhaps many of the family and friends. The aspect of personality is one that you could choose to bring out in your photographs, for a wedding provides a marvellous opportunity to take pictures of people, whether they are candid shots of the guests enjoying themselves, formal pictures of the ceremony itself, or portraits of the bride, groom and family.

One of the first opportunities for an informal portrait, if you are a friend of the family, occurs at the bride's home before the ceremony. Most brides will be nervous before such an occasion, so try to be reassuring and try not to use flash. If you keep your equipment to a minimum, perhaps using a fast film and a medium length telephoto lens, you will be able to stand back a little while the proud mother puts the finishing touches to her daughter's dress or make up, or the bridesmaids rearrange the flowers. In this way you can take some informal shots of the preparations without upsetting anyone or getting in the way.

If you do not know the bride's family well, and cannot ask to visit their home

first, try to reach the church or registry office early, so that you can photograph the bridegroom and other people of interest arriving at the scene. If you are early, you will have the chance to assess the lighting conditions, and to decide on the best position for you to adopt once the ceremony has begun. Remember that it may be distracting and impolite to wander around during the service, so choose your position with care. You should ask the vicar, priest or other authority for permission to take photographs. Most people will not mind a discreet picture taken without flash during a service, but photography is not usually allowed in synagogues.

The professional will be expected to cover the signing of the register and will take some flash pictures of the couple walking down the aisle. It may be difficult in these situations to find the room to achieve your own pictures, so it may be an idea to position yourself outside the church ready to take your photos, while the professional is busy lining up groups for the official pictures.

Group photographs are the most difficult part of wedding photography, particularly if you have taken on the task of official photographer, and they can be a real test of a photographer's skill and imagination. Traditionally, there should be a picture of the bride and groom with the bridesmaids, pages and best man, followed by a picture of the same group

with the couple's parents. Finally a picture of this group with all the relations is usually taken.

The bigger the group, the more shots are needed to ensure that nobody is making a face or looking away at the crucial moment. If you are taking the official photographs, it is your job to arrange the group attractively and decisively, without keeping people hanging around for too long. If you do keep people waiting, the results will show up clearly in your pictures as a group of very bored and impatient people. It is a good idea to think about the group shots beforehand—visit the location in advance to find out how much space you will have, and what sort of a background you may have to use, bearing in mind that car parks and streets may be full of cars on the day.

Whatever the group consists of, try to avoid the conventional line-up. A line of more than four or five people looks monotonous, and it is an idea to break the group up into rows, if you can possibly do so. Church steps are often used by official photographers for this reason because they help to break up the wedding group into staggered lines, without the danger of one person's face being hidden by another. Sloping ground may help to give you the same effect, but if the location has neither, an arrangement of two lines with the faces of the taller members in the back row showing

Reception An excellent time for candid shots—if you position yourself behind the couple, you can catch the expressions of people talking to them



John Sims



sure that every shot is perfectly focused, with ample depth of field. Give longer exposure times than normal, if necessary, in order to get good depth of field. Scan the scene carefully for waste paper and background objects such as cars. And if the churchyard or street outside the registry office is entirely unsuitable as a location, you can always assemble the groups later on at the reception, where the scenery may be more pleasant. If you decide that you want a really informal group, it will be much better to take the photographs at the reception, where everybody will be more relaxed and happy.

If the professional photographer is the one responsible for the group shots, it may be interesting, and perhaps informative, to see how he handles them. Some professionals tend to overdirect people taking endless shots to ensure that everybody in the group is looking their best. Others manage to achieve excellent results in a very few minutes by their cheerful yet authoritative manner which is the hallmark of a good photographer.

Although, in this case, you will not be able to arrange your own groups, this is a marvellous opportunity to take candid shots of the group, or even of individual members of the group. It is best to stand back, to one side of the professional, using a telephoto lens to take these shots. While the formal groups are being directed, you have a great chance between the official pictures when people take a brief opportunity to relax. Quite often one of the group makes a joke or a comment at which everybody laughs. These are the moments which will provide you with a much more lively record of the occasion, so do not miss them! After all, if everything goes wrong—the wind blows, the bride's veil takes off, the bridesmaids burst into tears and the page keeps running out of the group to mummy, the professional will be the one who tears his hair out because he cannot achieve a single successful photograph, but you will have a splendid set of original candid shots, which everybody will enjoy after the event.

One of the most important pictures of the day is the portrait of the bride and groom together after the ceremony. It is worth finding a quiet spot in a more natural setting, rather than the formal background of the church door, where everybody is probably staring at you and the couple as well. Here again, it may be better to shoot the portrait later on at the reception, when they will be more relaxed, and their feelings of happiness and love for each other may not be so buried underneath a nervous exterior. If they do not respond well when staring at the camera, ask them to talk quietly to each other, or at least look at each other while you are photographing them. Take a mixture of head and shoulders shots and full-length pictures, if you can. Many couples want romantic, soft focus photographs of themselves, and if you are the official photographer it may be a good

Look at the time! This picture has all the elements of a good candid shot—you could quite easily set up something similar to give some of your photos a lighthearted touch

Signing the register Many such shots are spoiled by cluttered backgrounds and fixed smiles—move in close to fill the frame and try to provoke an amusing and natural expression

between those in front works very well. The composition can look more interesting if the ends of the rows are curved in slightly towards the camera, or if the camera is positioned slightly higher than usual.

Whatever the group arrangement, remember that a tripod will be essential, since you will need to move between camera and group to make adjustments. Close attention to detail is crucial. Make



idea to ask them what sort of photograph they would really like. They may come up with some interesting ideas for you. If the reception is held at the bride's home, or even at a hotel, try to find a quiet room or a location outside where you can photograph them without the distractions of other people. Soft light falling through a window can produce a more natural effect than flash, and a home setting may be more attractive than a church door.

The reception itself usually begins with the bride and groom and their parents introducing themselves to all the guests. This is certainly worth photographing discreetly from a distance, with a medium length telephoto lens so as not to disturb the proceedings. Once the guests have been introduced and settle into the food and drink, they begin to relax and enjoy themselves. This is an excellent time for candid photography, since they will certainly not want to be organized into groups for formal photographs again. If you have a fairly quick eye, you can catch some amusing and delightful moments at the reception as people of different generations, old friends, relations, and even the not so friendly come together with an interest in common. The tension of the occasion begins to wear off completely at this stage, and people who have up to now been restricted by their formal attire, become happy, talkative, and even uninhibited.

This is not only the best time for candid photography, but it is probably the best time to ask the bride to pose for a few special pictures, whether or not you are the official photographer. Ideally, you will have already chosen your location and thought about the type of portrait you want. If so, you can approach her with confidence, and not waste too much of her time.

A portrait of the bride alone calls for some tact. Clearly, she will want to look her best, and you must decide which are her good features and try to give these prominence in your picture. If she has

beautiful hair or eyes, for instance, make sure that your composition and your choice of lighting make the most of such important features (see pages 756 to 760). On the other hand, she may have an unattractive quality which your photographs could help to obscure. If she is generously proportioned, ask her to stand at an angle to the camera or use

side lighting, which will be more flattering to her figure. Alternatively, concentrate on a head and shoulders shot. If necessary, use soft focus to hide any facial blemishes or poor make-up.

Backlighting can be particularly effective with this type of portrait, and will give you a much softer, more romantic image. Remember that the bride will



Geoff Howard

Look at that!

The best candid shots are taken while people are preoccupied

Formal group

For small group shots, look for a pleasant background

Informal group

Everyone relaxes after the service—look for people laughing



George Wright





Adam Woolfitt/Susan Griggs Agency

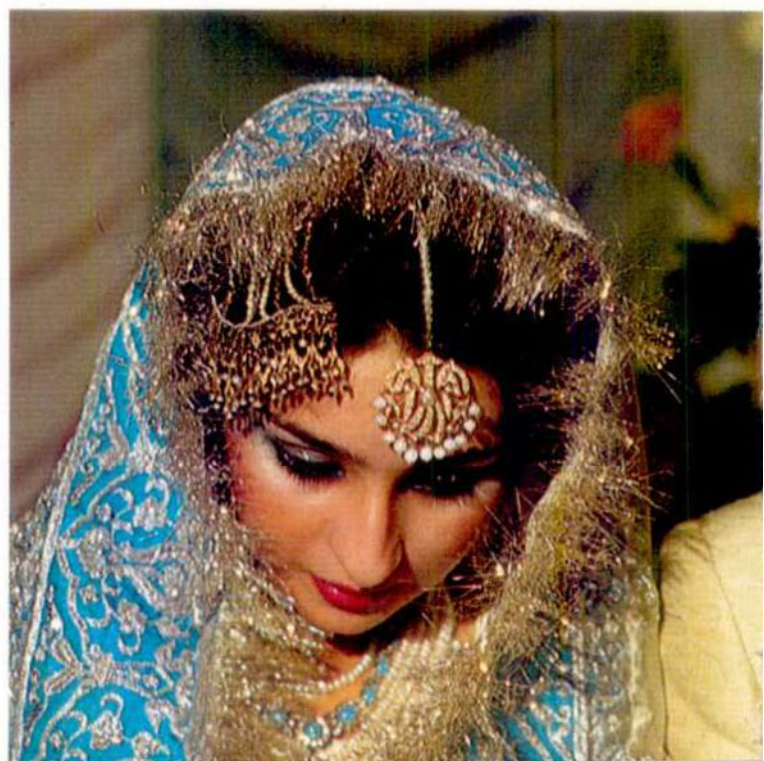


Anne Conway

In the coach
Shooting through the coach from the far side as the couple leave can give a nicely framed shot

Bride at home
Using a long lens to remain unobtrusive, you can find good, unposed shots as the bride prepares

have gone to a lot of trouble to choose her dress, and will want to show it off to its best advantage in these pictures. Take care that the dress is arranged well, and that your lighting is kind to the texture of the material, particularly if it is made of silk or lace. If she is wearing a veil, make sure that it is not at an awkward angle, and does not run the risk of blowing over her face just as you fire the shutter. As with the portrait of both bride and groom together, you will find that natural lighting, with a fill-in reflector or flash if necessary, will give you better results.



At some stage during the reception there will be speechmaking, which is another marvellous opportunity for candid photography. Do not take pictures of a nervous speaker, or you may cause further embarrassment. Wait until the speech is over, when the subject is relieved that the ordeal is over, and is probably smiling. However, if you are lucky enough to be presented with a humorous or articulate speaker, you may well find that this person will respond, and even be encouraged by, your photography.

After the father of the bride has made his speech, the best man follows, reading the telegrams and introducing the bridegroom, who concludes these formalities. Keep a look out for the reactions of the couple, or even an elderly relative, to the traditionally suggestive remarks made by the best man in his speech.

If you are taking the official pictures, you will be expected to include the cutting of the cake, which usually follows these speeches. Remember that you can direct the action, if necessary, and may ask for the knife to be repositioned after the first cut so that you achieve a good shot. You may have to use flash for this picture, but bear in mind that direct flash may flatten details, especially on the white dress and cake, so try to use bounced flash if you are happy with your ability to do this and the room is not too large.

The moment when the bride disappears to change into her going-away outfit is not the cue for you to relax as photographer. Traditionally this is the moment when the best man and friends play their games of decorating the

The church From the back of the church you can photograph the service and the interior without disturbing anyone

Head and shoulders Close-ups are rare, but can be effective, particularly if the bride has an attractive head-dress

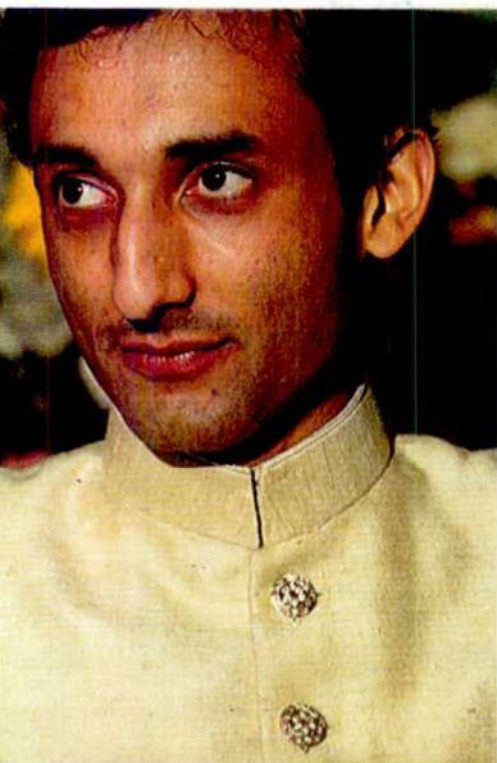
couple's car in some ridiculous and embarrassing fashion.

Finally, the bride and groom emerge to say their farewells and depart for their honeymoon. You will now have a last chance to photograph their exit, and the cheering crowds that follow them.

A wedding is one occasion at which the amateur photographer has a chance of taking pictures that will be really appreciated. It is also one occasion at which it is much better to use colour negative film rather than transparencies. People can look at prints much more easily when selecting them, and they will prefer to have a print to frame, or put into an album. It is worth asking a professional lab to make enlarged contact

sheets, which are easier to view than the smaller contacts. Be sure to take ample supplies of film: a professional may use something like 30 rolls of film, while many amateurs will take no more than five. But it is better to have too much film than to run out at the wrong moment.

However creative you want to be with your wedding photography, remember that the people who choose a traditional wedding are most likely to be those who want the more traditional and conservative type of photograph. If you are aiming to sell your pictures, it may not pay you to be too unconventional in your approach. Use your skill and judgement to make your photographs more than just a plain record of the day's events.



Geoff Howard

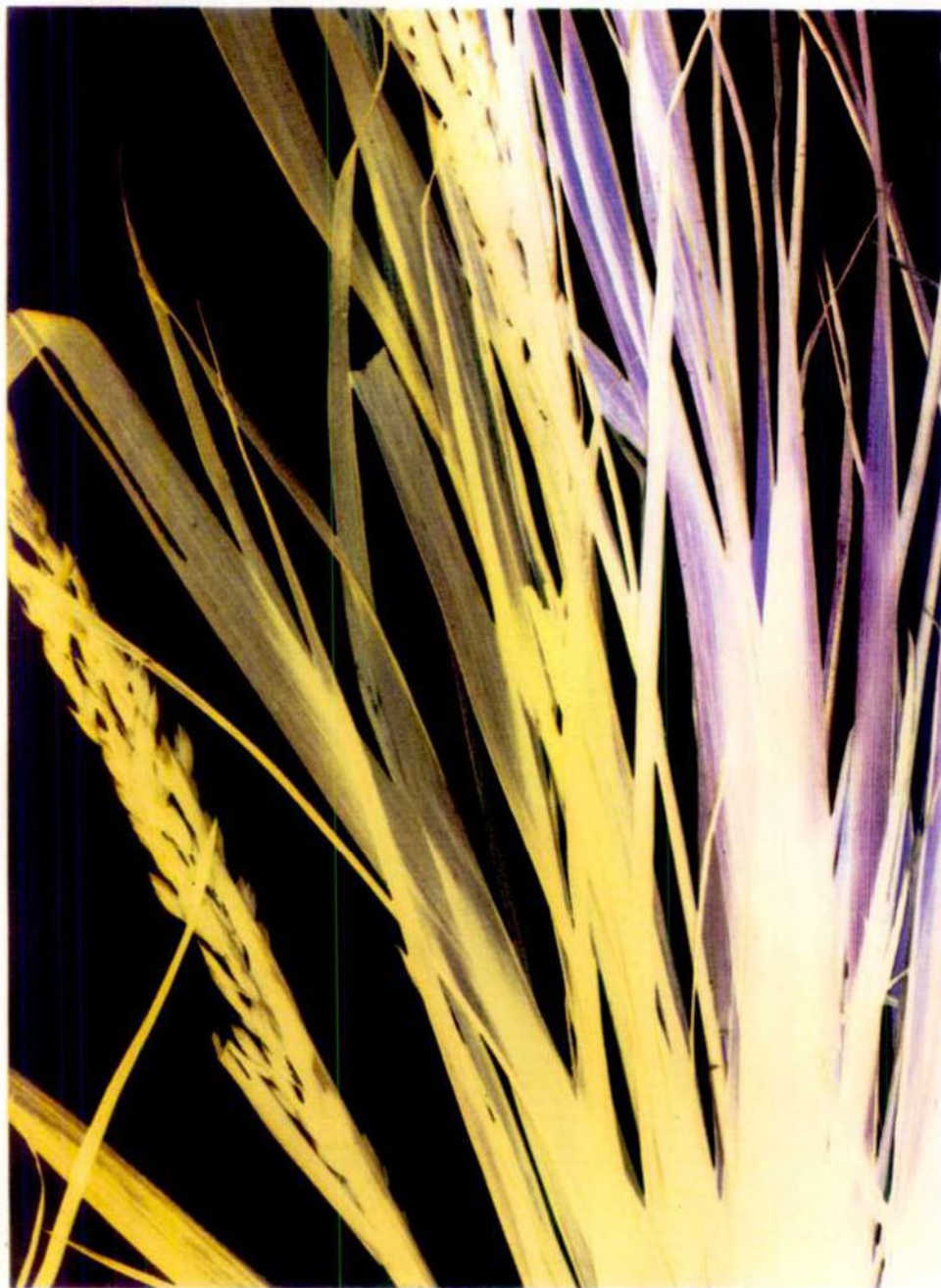
Adam Woolfitt/Susan Griggs Agency



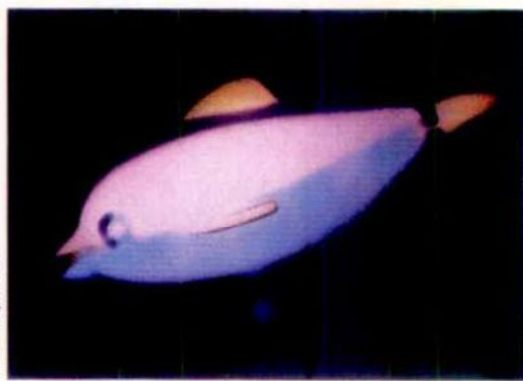
Darkroom

Photograms

Photograms—simple shadowgraphs—could not be easier to make; you don't even need a camera. With a little imagination and a few basic darkroom techniques you can create attractive and unusual images



Tim Stephens



Tim Stephens

Dolphin A plastic toy was placed inside the enlarger to create this image

Grass An image made by placing garden grass across the negative carrier

grams to create images. Many amateurs make a few photograms when they first use a darkroom and perhaps do not continue because it appears too limited and simple an art form. Photograms, however, need not be poor substitutes for true photographs, and if you apply patience and imagination, they can become a worthwhile alternative.

The grey scale

Before you can begin making photograms, it helps to find the characteristics of your paper by making a test print. With some bromide paper in the enlarger easel, stop down the enlarger lens to $f/11$. Cover the paper with card except for one narrow strip. Expose this area for 5 seconds and uncover a second strip, exposing this (as well as the first strip) for 5 seconds. Continue moving the card across the paper, making a series of 5 second exposures. If you make eight exposures like this, the first strip will have been exposed for 40 seconds, the second strip for 35 seconds, the third for 30 seconds and so on. Develop, fix and wash this print in the normal way.

With exposures ranging from 5 to 40 seconds, your grey scale should range from clean white to solid black. From this print you can work out what exposure to give in order to produce a particular tone of grey, black or white. You should make a new grey scale for each grade of paper you use.

Making a simple photogram

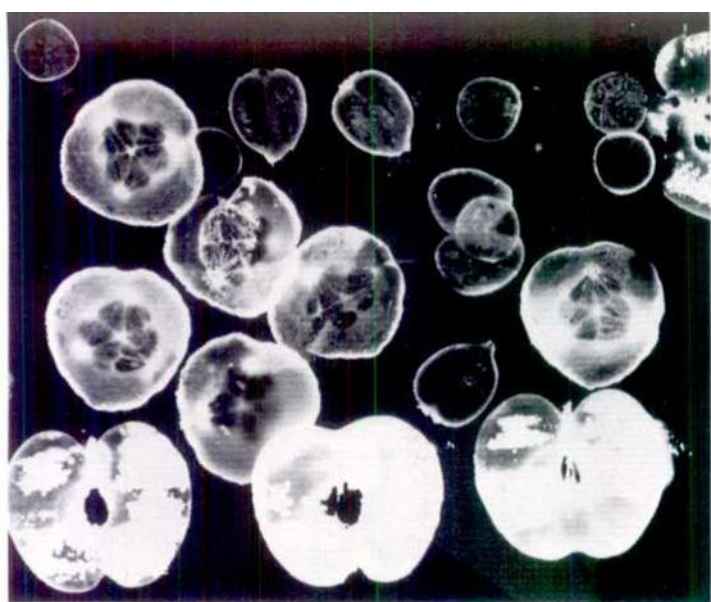
Set the enlarger lens to $f/11$. Put a piece of paper on the baseboard with a few objects placed on top. Now make an exposure that will produce a rich

A photogram is the simplest kind of photograph. You do not need a camera to make photograms—simply some photographic paper, a light source and something to place in the path of the light. Whatever you put in the path of the light casts a shadow on the paper and the photogram is really the negative image of this shadow.

Your enlarger is, perhaps, the best light source although you can, in principle, make simple photograms using a torch or sunlight. Photograms can be made in either black and white or colour.

They can be printed on to any light sensitive material—black and white paper, colour paper, reversal colour paper and black and white or colour film. If you make a photogram on film you can then use this as a negative and produce a positive print from it.

Photograms are as old as photography itself. Both Thomas Wedgwood and Fox Talbot began their experiments by placing objects on light sensitive paper. In this century, the Hungarian designer Laszlo Moholy-Nagy and the American artist Man Ray have worked with photo-



Slices of fruit simply left on top of photographic paper

black, referring to your grey scale to work out the time needed. Remove the objects after the exposure and process the paper as normal.

The result will be black paper with white silhouettes of the objects which you placed on the paper. The sharpness of the edges of the silhouettes depends on the height above the paper of the edge that cast the shadow and the aperture of the enlarger lens. The smaller the aperture, the sharper the edges. If you vary the 'depth of field' in this way, remember to vary the exposure time as well to give the same blackening of the paper.

The easiest things to make photographs with are everyday objects like keys, scissors and coins. If you lay these flat on the paper they will print as solid whites with clear edges. If you use something translucent or transparent then the object will print as a variety of tones of grey, according to the amount of light it lets through to the paper.

Scissors, keys, paper clips and other fairly flat objects produce easily recog-

Ships A drawing (below) was used as a paper negative and turned face down on to colour negative paper to create the photograph on the right



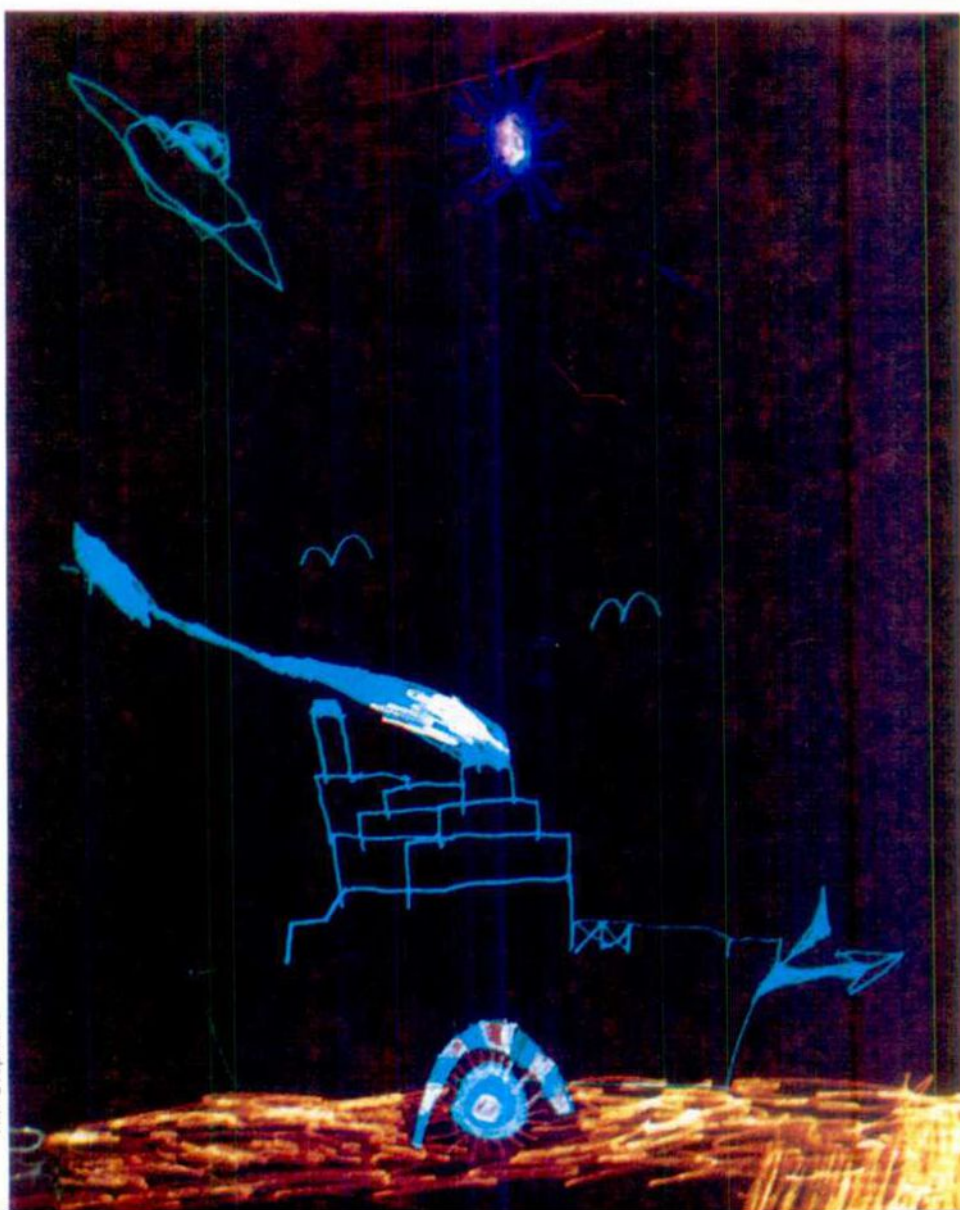
Florian Stephens



Bits and pieces This photograph was made by a young child

nizable silhouettes, although photographs, especially if they are black and white, often work best if they are more experimental and use objects with different degrees of opacity to create varying tones of grey. You can try putting pieces of crumpled silver paper, broken glass or cellophane on the paper. Anything that reflects, refracts or diffuses light is worth trying. Basic black and white photographs made like this are so simple even a child can produce them.

Another way to experiment is by moving objects during the exposure. If you touch the things on the paper during an exposure your hand will appear in the print as a vague pale area. To avoid this, make a few multiple exposures, moving the objects only when the red filter is in place or the enlarger lamp is off. To find the exposure necessary for each step, divide the time necessary for a standard exposure by the number of movements you intend to make.





Puzzled boy By successive removal of the jigsaw pieces, different areas of the paper were exposed to light. Between exposures the easel was rotated

Using a mask

You can make out of focus shapes on a photogram by placing a mask between the light source and the paper. Such masks are often used in combination with objects resting on the paper. The unsharp image of the mask appears to be an out of focus background, with the well defined shapes of objects as the foreground.

To work with a mask you should first take a sheet of glass larger than your paper and place it above the enlarger easel. The best way to do this so that you can have control over the spacing is to use wooden blocks such as children's building bricks. The glass acts as a support for the mask itself, which can be made of black paper if you want all the light to be stopped, or tissue paper if you want its image to be grey; Light flares around sharp edges so that a strong light source will cause noticeable flaring along the edges of the mask, rather like the sun's corona during an eclipse. The sharpness of the mask's image depends upon the distance between the glass plate and the paper.

You are now ready to create a more involved photogram. But the strength and quality of a photogram's image is often helped by a feeling of space, especially if it is an abstract image, so be careful not to make too complicated a picture.

Using the negative carrier

The most dramatic photograms are made by putting things inside the enlarger itself, in place of the negative carrier.

First put a glass plate or sheet of strong acetate in the negative carrier and rest a thin object, such as a pin, on it. Replace the negative carrier and focus the image on the easel. Three dimensional objects must be placed in the lens housing if they will not fit on the negative carrier. Use clear sticky tape or a piece



of cotton to fix the object across the negative carrier aperture, though bear in mind that the support will show on the print. Things you could try using for this kind of photogram include small toys, marbles, pieces of jewellery or almost anything with a simple shape, particularly if it is made partly of glass or plastic.

If you do put something in place of the negative carrier make sure it is firmly secured as otherwise it could drop on to the lens and damage it. Be careful not to use dirty or dusty objects as the bellows part of an enlarger is very difficult to clean out. Once the object is in the enlarger you should then stop strong light coming from the space left by the negative carrier, using black paper.

The size of the image of an object in the enlarger will inevitably be enlarged, to a greater or lesser extent, depending on the height of the enlarger head. The depth of field depends upon the lens aperture. Another factor that is less easy to predict is the amount of light that is reflected back on to the object from the lens bellows, which helps to give the

image a three dimensional effect, like a picture made in an ordinary camera. It may be worth lining the bellows with white paper or silver foil to increase this unusual effect.

Making a colour photogram

With colour materials you will be working the dark and all the steps involved in making photograms will need plenty of practice. Though difficult at first, the advantages of working in colour far outweigh the disadvantages.

Just as a grey scale is useful for making black and white photograms, you should first establish the colour balance needed to produce grey or black on colour paper. For Kodak Ektacolor paper, the filtration should be 75 yellow, 40 magenta, 00 cyan (abbreviated to 75 40 00). You should make a step exposure wedge at this filtration to act as a master exposure guide to help you work out suitable filtrations for a wide range of bright colours. Consult the chart shown here and if you want to shift the colours slightly, subtract 5 points in filtration from neutral of the colour you

Filtration with colour negative materials

More blue—add yellow
 More red—add cyan, or reduce magenta or yellow

Neutral:	65 40 00
Bright blue:	120 40 00
Bright red:	45 10 00
Bright green:	75 100 00
Bright yellow:	35 40 00
Bright magenta:	75 10 00
Bright cyan:	100 65 00

want to add, or else add the complementary colour. As the numerical value of the filter pack drops, decrease the exposure, and vice versa. If you are working with colour reversal materials, the opposite shifts apply, and you can judge the colours by eye.

The colour of a photogram depends mainly on the colour of the filtered light source in the enlarger, but various other factors can affect the end results. When objects are resting on the paper the colour may change if the object is brightly lit, highly coloured or translucent. The colour may also change if the light flares around the edge of the object. The colour can also be changed if instead of a black paper mask you use colour filters, or materials such as thin coloured cellophane.

Brightly coloured translucent objects placed inside the enlarger will usually show up as coloured on the final print if light reflects off their surface. In this case you should use the enlarger at neutral filtration. A bright red object will print as cyan on colour negative paper or red on reversal paper. Any shift from neutral filtration could cause an uncontrollable colour distortion. Colour photograms can be used as paper negatives and you can make a positive print by contact printing back on to colour negative paper.



Boxes in the enlarger By using polarizing filters, one above and one



Tim Stephens

One very effective and unusual form of colour photogram can be made using two polarizing filters on your enlarger. Put one filter in the negative carrier after putting some cellophane or stretched plastic in the bellows section. Attach the second polarizing filter below the lens. Clear plastics that are under stress will project on to the paper with a variety of colours. If you then rotate the lower filter the light areas change places with the dark colours.

One interesting photogram technique, possible in black and white but much more effective in colour, is to make combination prints.

Place a few objects on top of some reversal paper in the enlarger easel in complete darkness. Give the paper a long exposure to burn out all the areas not shielded from the light. Now put a transparency in the enlarger that you have already tested for filtration and exposure. Take the objects off the paper and give it a second exposure. The image will now record only on those parts of the paper that were previously



below the clear plastic boxes, spectrum colours appeared in their images

Chairs You can combine photograms with other negatives to make prints

covered up, the rest of the paper appearing white. Suitable objects for use with this technique include nets or grids, leaves or pieces of a jigsaw puzzle.

Making paper negatives

If you are working with standard negative-positive materials in either black and white or colour your photogram will be a negative image of the objects you use. If you would like a positive image you can make a photogram on negative sheet film and then use that to contact print a positive. An alternative to this is to use the photogram as a negative itself and contact print it, emulsion to emulsion, on to another sheet of the same photographic paper. The image will be sharp but reversed from right to left. If you expose the emulsion to the paper base of the photogram the final image will be the right way round but slightly unsharp.

The exposure needed to make a print will be at least four times normal. You should check first to see if the manufacturer's trade name is printed on the back of the paper as this will print through and interfere with the image.

Another type of paper negative photogram uses pieces of photographs, newspaper cuttings or drawings, and involves contact printing the assembled collage on to a sheet of photographic paper. You can also draw designs on clear acetate film and lay this over a sheet of paper before exposing it. This technique can be used in combination with any of the other ways of making a photogram.

Whichever kind of photograms you choose to make, you will find that a spirit of experimentation is the key to success. Photograms can be delightful and often surreal, and will both tax your imagination and add considerably to your understanding of how images are produced in the darkroom. The photogram is a much neglected artform that deserves the attention of both beginners and professionals alike.

The way we see

Photography and human vision are often compared—indeed, they share some common features—but there are fundamental differences between them which give each a unique view of the world around us

The eye is often compared with the camera. Indeed, at a superficial level there are a few common features. But it is wrong to push the comparison too far, as the differences are more important than the similarities.

The main similarity between the eye and the camera is that they both use a lens system to form an image on a light sensitive surface. Our view of a scene is, in fact, based on two tiny upside down images formed on the rear, inner surfaces of the eyes—the *retinas*. These are light sensitive layers connected to the brain by the *optic nerves*, and consist of a mosaic of receptor cells.

An image is formed on the retina by a lens system. Light arriving at the eye is refracted by the *cornea*, passes through a clear liquid known as *aqueous humour*, through an aperture called the *pupil*, and then is refracted more by

the *crystalline lens*. The function of this lens is simply to alter the lens system in order to focus on objects at different distances. This process is known as *accommodation*, and is achieved by a muscle, called the *ciliary muscle*, which alters the focal length of the lens. It does this by changing the shape of the lens—a major difference between human and photographic systems. After leav-

ing the lens system, the light passes through more transparent liquid, known as *vitreous humour*, to the retina, where it is picked up by the receptor cells.

There are two basic types of receptor cell. *Cone cells*, which respond to normal and high illumination levels, are responsible for colour vision and are concentrated mainly towards the centre of the retina. At the centre, in the

Inverted image The lens system of the eye forms an upside down image of the subject on the retina

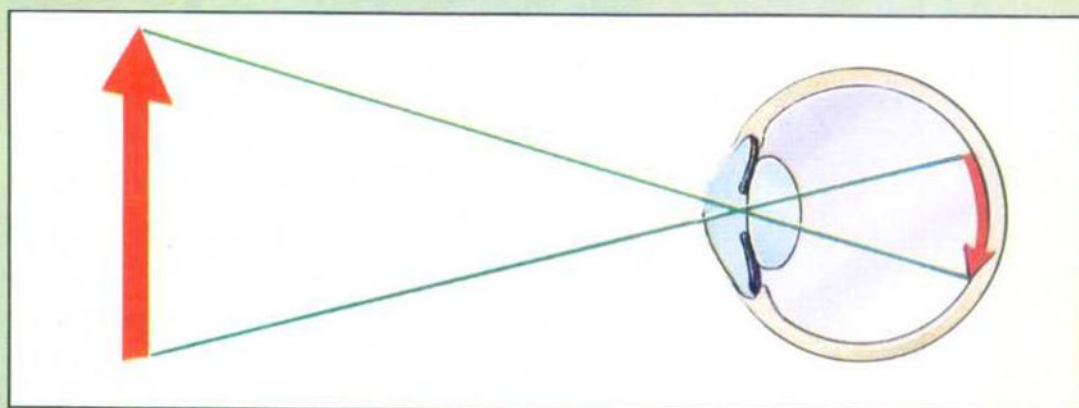
region known as the *fovea*, there are only densely packed cones. This area is responsible for the sharp vision which exists at the centre of the visual field.

Rod cells are sensitive to low light. They produce no colour sensation whatever and are more dispersed, being situated mostly towards the edge of the retina. This is why in low light, when only the rods are working, vision is much less sharp than under normal conditions.

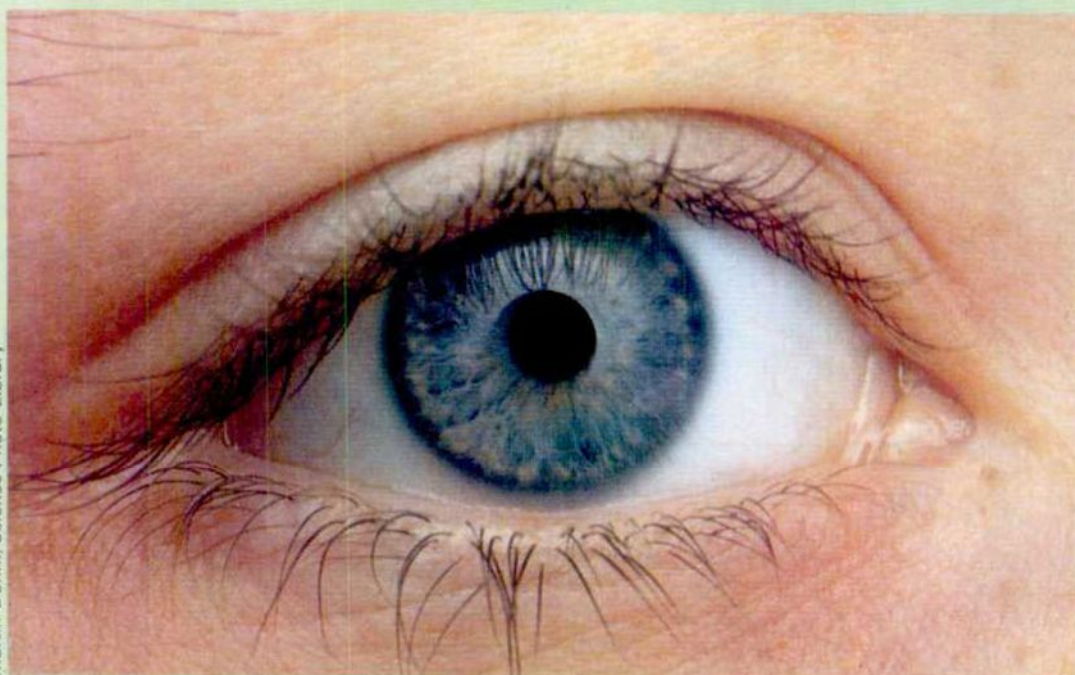
The uneven distribution of the cells means that the image deteriorates towards the edges, where the cells are less dense. The entire field of view of human eyes is very wide—up to 180° horizontally—but the edges of vision are useful only for the perception of movement.

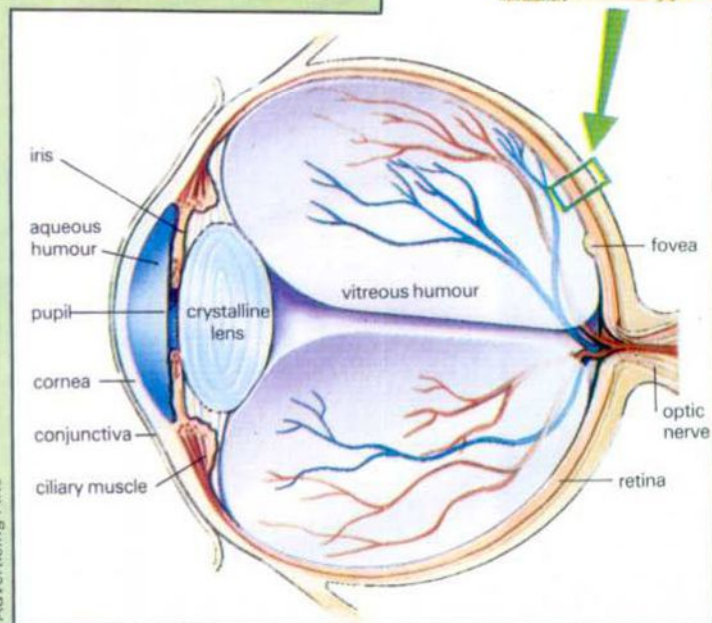
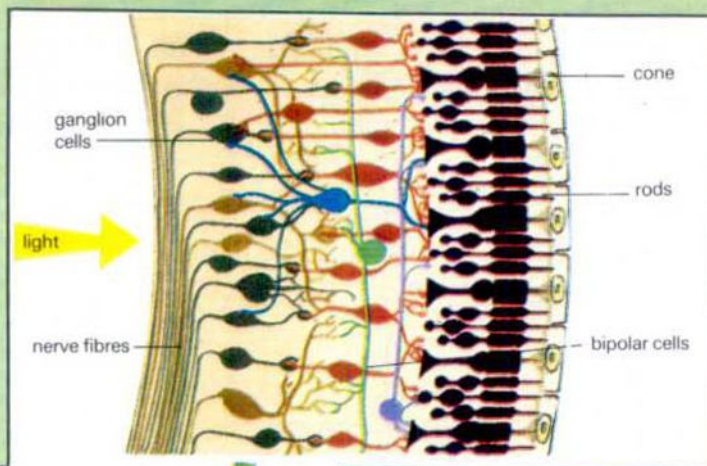
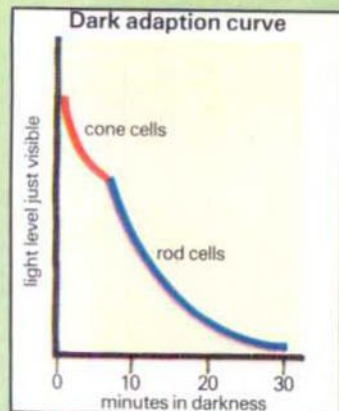
In a camera, however, the resolution is nearly the same over the whole image area. With human vision, in order to build up a detailed picture

Bright light The pupil narrows to reduce the light entering the eye



Advertising Arts





The human eye There are many differences between the eye's image system and that of the camera. One of the most interesting aspects is the way in which light must first travel through various tissues and blood vessels before reaching the actual light sensitive surface underneath, so reducing the light reaching the cells

which have become dark adapted—are dazzled when suddenly confronted with daylight. When going into the dark, adaptation may take as long as half an hour.

To enable the eye to adapt to the lower luminance of a camera focusing screen, therefore, it is helpful to exclude all extra light. By using an eyepiece cup, collapsible hood or focusing cloth, the screen actually seems brighter.

A film has no powers of adaptation. When photographing a scene, the exposure is usually a com-

promise between the various tones. Details in shadow or highlight areas may be lost. The eye, however, moves from one area to another, adapting for each different light level—within limits.

One advantage photography has over human vision is that light has a cumulative effect on film. In very low light, an image can be built up over several hours. The limiting factor is reciprocity failure (see page 466). With the eye, a certain minimum amount of light must fall on the cells within a specific time period (about one tenth of a second). If a sufficient quantity of light does not arrive within this time, no image will be perceived.

Most cameras are confined to a single view, and a two dimensional result. Human vision, however, is not just one view but two. The images received by the brain are combined and related to the angles of view of the eyes (like a rangefinder—see page 614) to give a sense of depth. This is *stereoscopic vision* and enables us to judge near distances with great accuracy.

It can be seen that human and photographic systems use different views of the subject, and employ different methods of recording it. There are many other differences, particularly in regard to colour (which is dealt with in a subsequent article). In fact, the dissimilarity between the way we see and the way the camera records is one of the features which makes photography interesting.

of the whole scene, the eyes and head are moved in a scanning motion. In this way, all parts of the scene are viewed separately by the sharp central region of the eye—the fovea.

Although the image is upside down, this does not create any problems. The brain corrects information coming from the eyes so that the world is not seen inverted.

Human vision is capable of making a number of allowances for various conditions. One of the most important of these is *dark adaptation*. The use of different cells, combined with variation in the size of the pupil, allows the eye to adapt to a range of light levels. The *iris*, the coloured part of the eye, changes so that the width of the pupil increases in low light and decreases in bright light—in a similar way to a lens aperture.

The adaptation process may

take some time if the brightness difference is quite large, for there is another mechanism at work—the release of a chemical called *visual purple*, which gives the retina further sensitivity. Eyes which have become used to the low light in a darkroom—

Low light The pupil widens to admit more light, like the aperture of a lens





World of photography

Anthony Crickmay

Internationally renowned as a dance photographer and, more recently, for his fashion photography, Anthony Crickmay is at the top of his profession. He is famous for his ability to capture movement and grace

In the world of ballet photography, Anthony Crickmay reigns supreme. He is the leading photographer of dance: a man with the ability to capture the very essence of ballet and freeze it on film, transfixing all the grace and fluid movement of the dancer in a still shot.

He became interested in photographing ballet early in his career. He had

taken a series of pictures of the Spanish dancer Antonio, and hung some of the prints on the wall of a studio he was using. By chance, they were seen by the famous accompanist Ivor Newton, who worked with some of the major singers of the day and had a house next to Crickmay's studio.

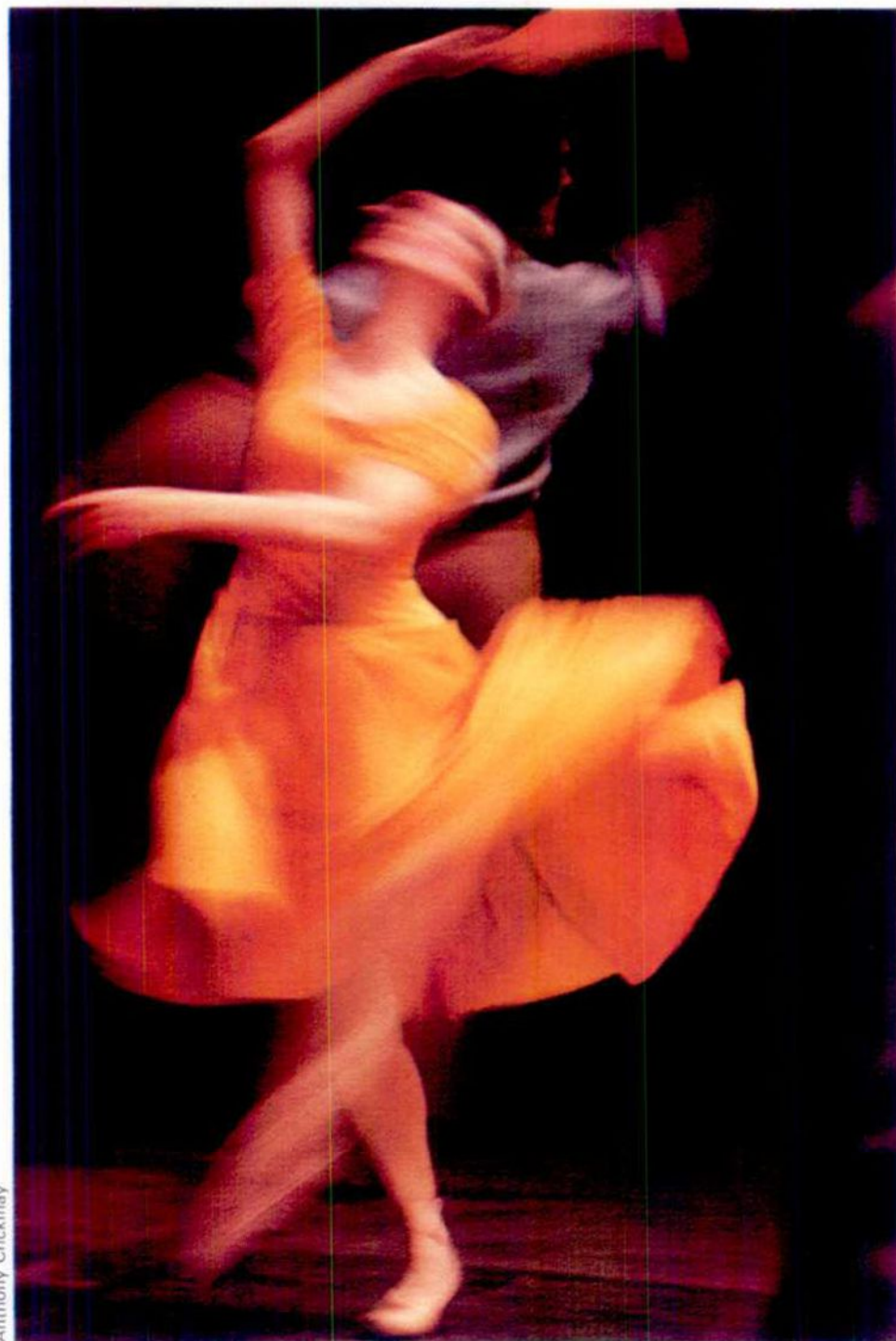
As a result, Newton asked Crickmay

if he would like to take some pictures at Covent Garden Opera House in London, where the Royal Ballet has its base. Crickmay was interested but rather doubtful about the subject matter. 'I'd never been to Covent Garden in my life . . . but I was prepared to do anything if it helped to pay the rent.

'In fact, I ended up photographing an opera on my first assignment and I was absolutely bowled over from the moment the curtain went up. Later, the Covent Garden press office asked me to do some more work for them. The first pictures had turned out quite well and they felt I needed encouraging. They told me that the next project they had for me was photographing a ballet company.' Again, Crickmay was full of misgivings, but the performance by the Kirov Ballet Company from Leningrad was entrancing. Crickmay was captivated and he has been photographing dance ever since.

'Like photography, ballet is a very visual medium and the two have an obvious rapport. But the other element, the human element, amazes and binds me—the fact that humans can so train themselves that they seem to break all the laws of nature. They can fly, they can glide, and their achievement is such that they transcend our rigid perceptions of gravity.

'Having said that, those are the very things that make photographing ballet so difficult. It would be wonderful to take pictures of dancers, completely forgetting all considerations other than showing the great art that they perform. Of course, you can do that sometimes,



Anthony Crickmay



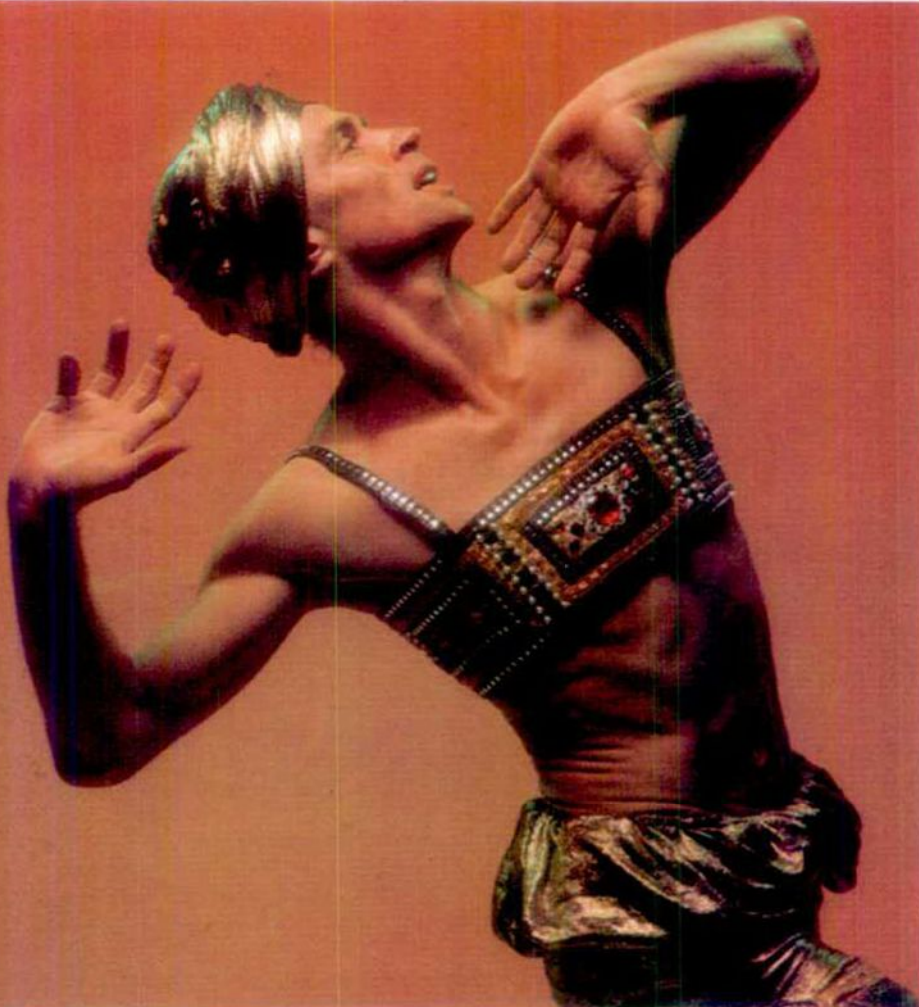
Anthony Crickmay by Sudhir Pithwa

Caught in motion This whirling dancer was caught during a performance of *Daphnis and Chloe* by the Royal Ballet



The dying swan Maya Plisetskaya of the Bolshoi Ballet taken during a special photo call for *Swan Lake*

Rudolph Nureyev Taken at Crickmay's studio to publicize the London Festival Ballet's production of *Scheherazade*



but an important part of the work is to produce publicity pictures. These have to be exact, with the dancers in the correct positions, from the tips of their fingers to the tips of their toes and that puts an enormous strain on both the photographer and the dancer. I can't move an arm or a leg just because, in my opinion, it would make a more pleasing shape. I have to make sure that the dancer is in the correct position so that she or he will not be upset if pictures of them in what they consider to be "bad" positions appear in the press.

'Within those restrictions, you can still have enormous fun. And if you are working with the very great classical dancers—like Nureyev or Baryshnikov—they are so phenomenally good that, even if the restrictions are great, the results can be quite extraordinary.'

Anthony Crickmay has photographed practically all the great dancers at least once, and one of his favourites is Lynn Seymour. He recalls one of her trips to his studio with some alarm—she nearly ended her career on the steep wooden steps leading up to his studio. 'She fell from top to bottom, with me standing there having a heart attack because she



had only just returned to the stage after recovering from a leg injury. I think it worried me far more than it did her. She thought it all very funny—and far safer than some of the violent *pas de deux* she has to perform.'

Although Crickmay uses his studio for individual and portrait shots of dancers, much of his dance photography is done in the theatre. 'Some of the sessions I work on are quite hilarious. I remember once working on an eight hour photo call with a ballet company who were performing *The Sleeping Beauty* in Oxford. Eight hours is a very long time for that sort of thing but when you've got a three act ballet to photograph in both colour and black and white, you really have to go at it. It works fine for me but the company gets more and more exhausted as the hours go by, with the director shouting things like "straighten your leg" or "lift it higher" or "your arms look hideous."

'All this was going on in Oxford and I was shouting to someone to move to the left or right a bit when one of the dancers said, "Tony, do you mind if I leave the stage for five minutes?" "Make it ten." I replied. "That's all right," she said. "I just want to go out to the wings and scream." Whereupon she left the stage, opened her mouth and let out a great scream. She came back, said "I'm fine now"—and we all burst out laughing. It took all the tension out of a very long day.'

Crickmay is a perfectionist. Like many of the great artists that he photographs he pushes himself to the limit to achieve his fine results—capturing the exact moment when both the dancers and the movement they are performing are at the

peak of perfection.

His dedication to perfection shows itself in his attitude towards black and white printing. This was something he learned during his first days as an assistant to the portrait photographer, Lotte Meitner Graf. 'I've never lost that feeling for precision in my work. Each print has to be right. It's either right or it's not.'

'When you're printing ballet or theatre press shots in the middle of the night and you've still got another three hundred to do, there's an awful battle between what you know is right and what will be acceptable. It would be easy to settle for something less than perfect, but I couldn't do it. That is something of Lotte's teaching that will always be with me.'

At the time he started working for Lotte, he was working behind the counter at Wallace Heaton, a camera shop in London, where he had started as a humble packer when he first left home and moved to a bedsitter. A friend of his told him that Lotte needed someone to help out in the studio. Crickmay had never really given any conscious thought to a career before then, although, as he says, he always knew that it would be something to do with photography.

'I don't know how or why, but I was always taking snaps. I had no money whatsoever and my family certainly didn't have any, yet I was convinced that it would all happen. The fact that I had no idea how, didn't seem to worry me. It was extraordinary.'

So, at the age of seventeen, he went to work for Lotte Meitner Graf and this gave him the rigorous grounding that

Dancers in flight Kate Harrison and Linda Gibbs during a performance of Robert Cohan's class in 1975

The sinuous figure of Siobhan Davies. A publicity shot for a performance of *Harmonica Breakdown* in London

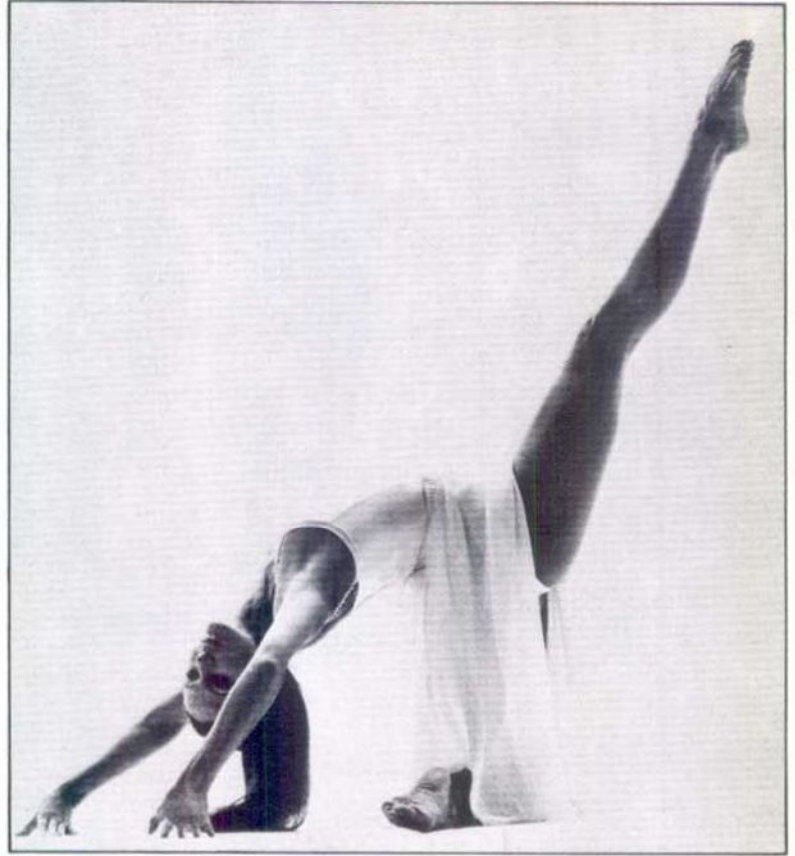
Surrender Kate Harrison posing in the studio for the publicity for the London Contemporary Dance Theatre's *Field*

A superb leap photographed during the London Contemporary Dance Theatre's production of *Cloven Kingdom*

enabled him to start up on his own three years later. Lotte was Viennese and came here as a refugee during the war. She came from a school of first class portrait photographers of the 1930s and 1940s and was absolutely superb. She was a remarkable woman and I learned a lot from her—but, as she also had an extremely powerful personality, I had to unlearn a lot of what she taught me.'

'At that age you are very impressionable and to me Lotte was the best. For her, there was only one way of doing things and that was her way, the way she taught me. When I left her, I found myself trying to copy her style. It took me a little time to meld the extreme precision and care she took with her pictures with the need to express myself in the way that I wanted.'

Anthony's association with Lotte ended rather abruptly. 'We had a grand row,' he recalls. 'She threw a cup of coffee over me and I threw a box of prints at her. She told me she hated me and I replied that I rather thought I



Anthony Crickmay/London Contemporary Dance Theatre



Anthony Crickmay/Ballet Rambert

hated her too. Then she relented and told me that perhaps she didn't actually hate me, but I decided to leave anyway. We actually stayed good friends until her death and I'll always be grateful to her for all that she taught me.'

After leaving Lotte's studio, Anthony had to find a job fast. He had to pay the rent on his Earl's Court bedsit and he had to feed himself, so he took another job in a camera shop. 'I was there for about six months, when I suddenly thought how mad I was being back where I started.'

'I decided that I would have a go at making it on my own as a photographer, so I bought myself a Rolleiflex and handed in my notice. A very kind friend let me use his studio on the basis that I would pay him for the studio if I got a job. I then rang all my friends and anyone else I could think of and asked them if they wanted their pictures taken.'

Still a vivid memory, those first days can now be remembered with affection, for Anthony Crickmay fast became internationally renowned as one of the finest photographers of dance in all its many forms. In the twenty years during which he photographed dance exclusively, his portrayals of the world's finest dancers and companies, together with the most excellent productions, were unrivalled.

He has also contributed to a large

number of books on dance, both as a consultant and as a photographer, and a book of his dance pictures is being produced.

Anthony Crickmay is also a rarity in the photographic world for more than the obvious talent he possesses. In recent years he has managed to step out of the narrow world in which he specialized and add another dimension to his photography, that of fashion.

'After twenty years of dance, I began to get a severe case of indigestion and it became necessary to find something else to pep me up. It just so happened that the editor of *Vogue* magazine phoned me one day and asked if I'd like to do some fashion shots for them. I jumped at the chance and I've never looked back.'

Now he does more fashion work than dance and he sees the two as closely linked. 'I think the mixture of dance and fashion is terrific. I enjoy it so much. I feel I can bring the subtlety of fashion to dance and the sense of movement of dance to fashion. At least, I hope that's what I do.'

Fashion photography has also given him increased opportunities to travel, an enjoyable bonus. He looks on it as a kind of hobby, together with playing the piano and learning Arabic.

'Moving on to something new like fashion has really broadened my horizons. If it were ever possible, I'd

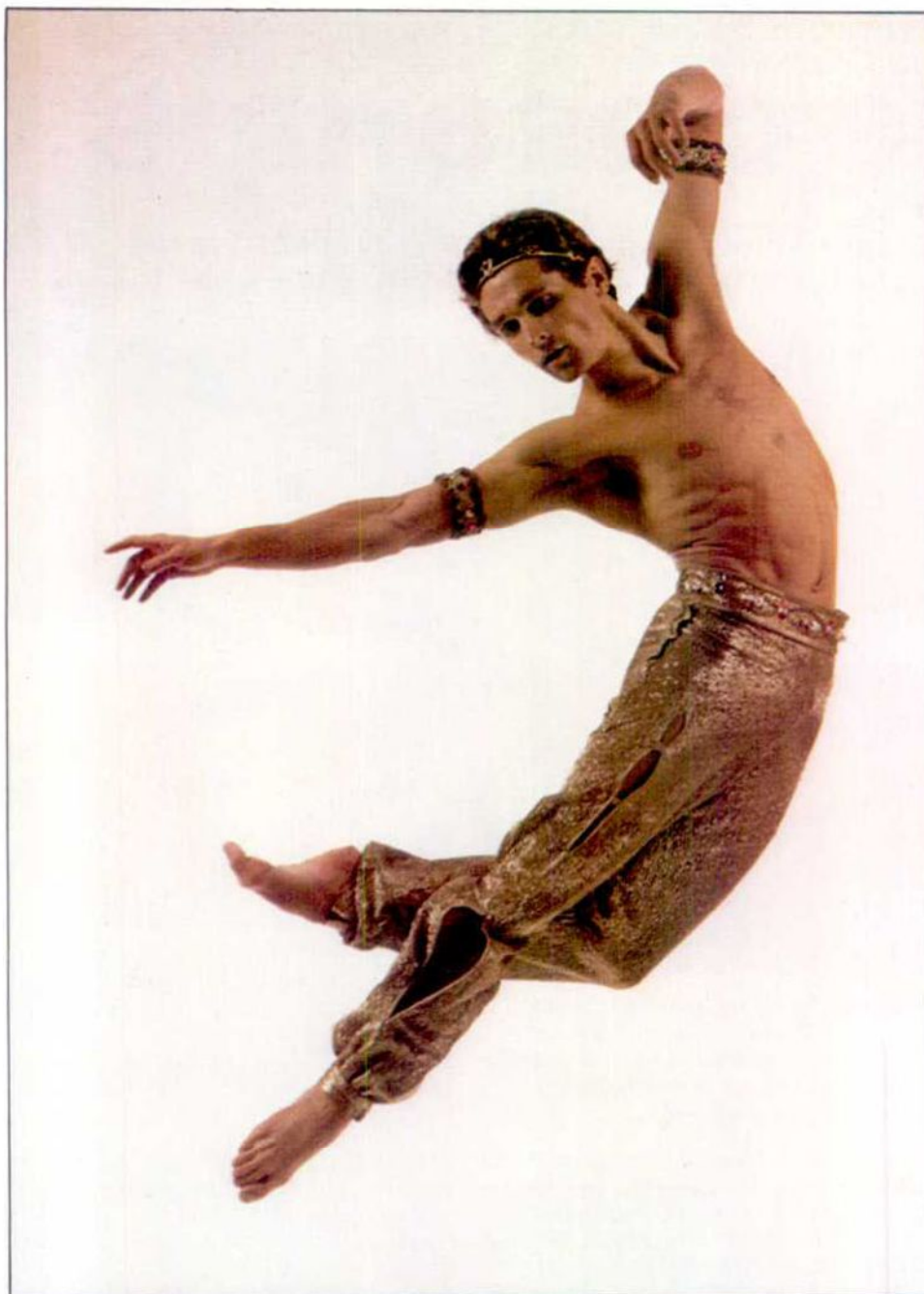
Night of the Waning Moon Sally Owen and Thomas Yang in a production by the Ballet Rambert in London

like to take a year off and spend it in Morocco, photographing its people and the wonderful colours. My first visit was for work and I fell in love with the place. I spend as much time there as I can now.

'I'm also trying to buy a house in Morocco, although dealings of that nature aren't exactly easy in Marrakesh. It would give me a base to work from. I'd like to do some reportage on village life—just take one particular village and photograph every aspect of it. I have a village in mind but, to do something like that successfully, I couldn't just sweep in with my cameras and sweep out again.'

'I would have to spend time in the village, live there even, so that people got used to seeing me about and accepted me, before I ever started taking photographs. It would mean working at a different pace from my normal one—far slower and more relaxed.'

Until he can realize this dream, Anthony Crickmay continues to work from his London base. This is a roomy studio in his house—a tall, narrow building with open plan floors. At present, he works alone since he is 'between assistants', but he employs freelance assistants when he needs them.



'Although I don't have a permanent assistant, I tend to use the same one on a freelance basis.'

Anthony's fashion and dance photography is supplemented by commissioned portrait photography. 'I used to do a lot of straight theatre work but now my portraiture tends to be in connection with my work for different magazines. It's changed in that I now work more through the magazines than directly for the people concerned and this changes the emphasis.'

Whichever kind of work he does, Anthony uses the same two cameras—Nikon and Hasselblad—and uses a wide range of lenses. For portraiture, he prefers to use the Hasselblad with a 150 mm lens, though he also has lenses ranging from 50 to 250 mm. For his Nikon he has lenses ranging from 24 to 500 mm, and he uses this camera for close-ups of dancers on stage photo calls.

'I use almost every kind of film. Pan-F and Tri-X for my black and white work, and, for colour, Kodachrome 25, Ektachrome 64 and Ektachrome 400. I'll occasionally use filters for black and white, but not for colour.'

His one regret in all his years of being a photographer is not having had an art school training where he would have learned the technical side of composition and graphics. 'Untrained you get there in the end but you have to work harder at it. I always feel that those photographers who have been to art school have a sense of composition that it's taken me years to acquire. I'd like to have learned all the technical side, the history of graphics and so on. Perhaps I will. After Arabic'

Le Corsaire Peter Schalthuss caught in mid air in a picture taken at the studio for the London Festival Ballet

On stage A line-up of some of the principal performers in the Ballet Rambert's production of *The Tempest*





Improve your technique

Simple close-ups

Using close-up equipment to move in and focus on a detail can often result in as interesting a photograph as a shot of the whole object

Any photograph looks better when the frame is filled by the subject, but when you are photographing objects only a short distance away, it is sometimes impossible to focus the camera close enough to do this. Most 35 mm SLRs focus down to about half a metre—close enough to fill the frame with this page. It is not difficult to make lenses that focus closer—macro lenses do just this—but as you get nearer to the subject special problems begin to crop up. Half a metre is about as close as you can get without using special close-up techniques, so it is a sensible point to fix as the minimum focusing distance for standard lenses.

Close-up equipment

If you already own a zoom lens, you may not need any special equipment to take close-up pictures. Many zooms have a macro focusing facility, which makes it possible to focus on much closer objects than standard lenses can cope with. Some of these lenses focus as close as 15 cm, but are used at a long focal length. In this way, they are able to form images as big as 1:3—that is, where the image on the film is a third of the size of the original object. The quality of the pictures is usually poor, however, and for serious close-up work, macro zoom lenses are not really adequate.

True macro lenses are quite different from macro zooms. They are specially constructed for close-up work and usually focus from infinity right down to 1:2 (half life size) with a single turn of the focusing ring. Another feature that distinguishes them from other lenses is the design of their optical components. The aberrations of macro lenses are balanced so that they give their best results at short distances. Most other lenses work better when the subject is three metres or more from the camera. Unfortunately, macro lenses are bulkier than ordinary lenses, have quite small maximum apertures, and are rather expensive.

A much cheaper way to take close-up pictures is to use extension tubes, or supplementary close-up lenses. Supplementary lenses screw into the front of the camera lens, just as a filter does. They change the effective focal length of the lens, which enables you to focus on objects nearer the camera. How they work is explained on page 658.

Extension tubes are simply short metal rings which fit between the camera body and the lens. Because they move the camera lens out from the body, nearby objects are brought into sharp focus,



Butterfly To fill the frame with a small subject, you will need to move in very close. A set of extension tubes moves the lens far enough out to bring a tiny subject like this into focus

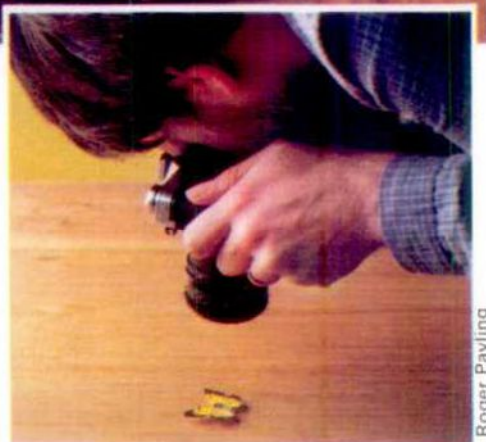
Both extension tubes and close-up lenses are sold either individually or in sets, and are described in more detail, together with macro lenses and other close-up equipment, on pages 404 to 407.

Whatever equipment you use, close-up photography needs more care than that of distant subjects. Because the images on film are bigger, camera shake becomes more obvious, and it is essential to keep the camera very steady. Focusing is critical, because depth of field is greatly reduced—often to a matter of millimetres—and there is no margin for error. Exposure measurement is sometimes complicated by the fact that certain close-up methods require extra exposure according to the magnification of the image.

Supplementary lenses

Close-up supplementary lenses minimize these problems. This is partly because only moderately close subjects can be handled by this method, and pictures in extreme close-up—where the problems are greatest—are better left to other types of equipment. Because they are simple to use, however, a set of close-up lenses is a good introduction to close-up photography.

Close-up supplementary lenses look



rather like clear glass filters, but with a slight curve. Their power—simply, the degree of effect they have in focusing the lens closer—is measured in dioptres. The dioptre power is equal to the reciprocal of the focal length of the close-up lens. A one dioptre lens has a focal length of one metre, a two dioptre 0.5 metre, a three dioptre 0.3 metre, and so on. The higher the power a lens has, the more effect it will have when it is attached to the camera lens. When lenses are used in combination, the powers are added together to get the new power.

If you focus your camera lens on infinity, and then fit a close-up supplementary lens, the new point of sharp focus is equal to the focal length of the supplementary. If you are using a two dioptre lens, for example, the new focus point will lie half a metre from the camera. With the lower power lenses,



Focusing for close-up At short range it is easiest to focus by moving back and forth until the subject appears sharp in the viewfinder

close-up lens and a special adapter, which simultaneously corrects parallax and alters the rangefinder to work at short distances.

The major drawback to close-up lenses is that the image quality they produce is not very good. This is particularly true with high power close-up lenses, but whichever one you are using, you should stop the camera lens down to the smallest practical aperture, as this will improve the performance of the combination. Use the weakest close-up lens possible, and never use two supplementary lenses if you can get away with one. If you have to use two, fit the stronger one nearer the camera.

Using extension tubes

Extension tubes are much more expensive than close-up lenses, but they are capable of much better results. They can, however, only be used with SLR cameras. They are generally sold in sets of three tubes, each with a different length.

In use, one end of the tube is fitted to the camera body with the lens fitted into the other end. With the more expensive tubes, your camera's meter remains coupled to the lens by a series of rods and levers, but the cheapest tubes do not have this facility, and the meter can only be used in the manual mode.

The focusing distance—and also how much the image appears enlarged—depends partly on how far the lens is from the film. The larger the lens exten-

turning the focusing ring brings the point of sharp focus closer to the camera, but high power supplementaries have such a strong effect that the focusing ring becomes virtually useless. In this case, the simplest way to focus is to move back and forth, nearer and farther away from the subject, until the image snaps into focus in the viewfinder. This technique is useful for all kinds of close-up work, since at short distances a small change in camera position produces a dramatic change in the plane of the subject that is in focus.

Because a close-up lens provides only a limited focusing range, it is most convenient to buy two or more of them to use either in combination or individually. The most useful powers are +3 and +2 dioptre—lower powers have too little effect when used with a standard lens, and higher powers, too much.

Although there are formulae which can be used to calculate the new point of sharp focus when a close-up lens is fitted to a prime lens, these are unnecessary when using an SLR camera, because the image can be viewed directly through the lens. Once you get used to using close-up lenses, you should not find it difficult to pick out the one that you need for a particular subject, but the chart on page 406 shows the range that can be covered by a standard lens and a range of supplementary lenses.

Close-up lenses have less effect on wide angle lenses, and more effect on telephotos, so if you have a range of lenses, it might be worthwhile trying out a close-up lens with several of them, as this will make a wider range of magnifications possible. This is only possible if all the lenses take the same diameter of filters, or if you have step-up or step-down rings to suit all your lenses.

The greatest advantage of using close-up supplementary lenses is that, unlike other close-up methods, no exposure

compensation is necessary, and the viewfinder does not darken. This means that focusing and composing the picture is easy, and can be done in the usual way. A further advantage is that even if your camera does not have a TTL exposure meter, exposure readings from a hand-held meter will still be accurate—this is not the case with other close-up systems.

A few non-SLR cameras accept close-up lenses, but these are usually of quite low powers, and focusing must be done by guesswork or calculation. Higher powers make the camera viewfinder useless, because parallax becomes a serious problem, and with twin lens reflex cameras focusing becomes a tedious routine involving swapping the close-up lens from the viewing to the taking lens and back again. Rangefinder cameras can sometimes be fitted with a

Fitting a ring Attaching an extension ring is no more difficult than changing a lens. Bayonet mounts couple the ring to the camera body and lens and take just a few seconds to fit





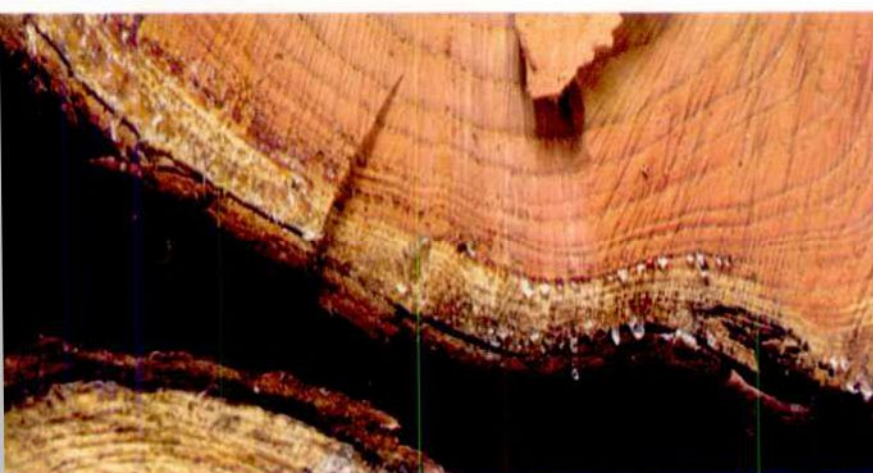
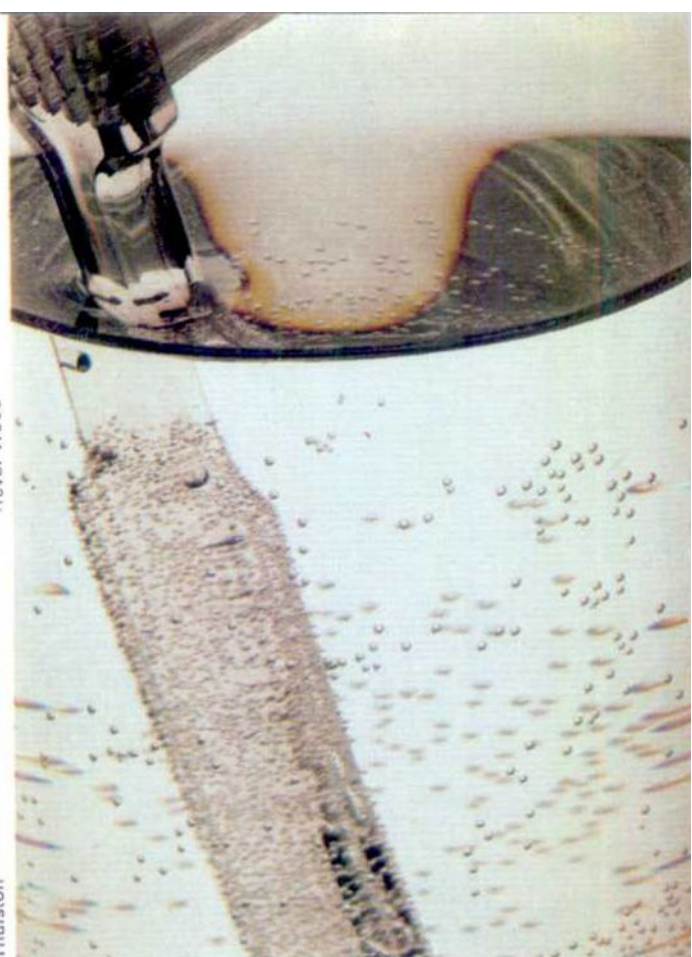
Trevor Wood



Michael Siebert



Patrick Thurston



Michael Siebert



sion, the greater is the degree of enlargement, so stacking up three extension tubes behind a lens allows you to focus much closer than if you just use one. The focal length of the lens in use also has an effect. The longer its focal length, the greater extension is needed to reach a particular magnification.

If a lens is moved from the film until it is twice its focal length away, the image on the film will be exactly the same size as the subject. This means that to form a life size image, a 200 mm lens needs a four times as much extension as a 50 mm.

The exact size of each extension ring varies between manufacturers so the precise degree of magnification also varies. The ideal set of rings would enable the photographer to focus on any point from the minimum focusing distance of the lens alone, right down to life size or closer. In reality, this would need

more than three rings, and most sets either leave gaps in the focusing range, or cover a more limited range of magnifications. However, most close-up pictures can be cropped at the printing stage if the subject does not fill the frame perfectly, so this is not a really serious drawback.

Focusing with close-up lenses is partly a matter of knowing which tube to fit in order to get the subject in focus at a certain distance, though this is easy to learn with practice. Once you have fitted a tube, moving back and forth brings the subject into the plane of sharp focus. As with close-up lenses, the focusing action of the lens itself is only of limited use, though it can make quite a difference with the shorter tubes.

Focusing is hindered by the fact that at high magnifications, the light from the image is spread out over a larger area

Common or garden close-up *The beauty of macro photography is that it enables you to see ordinary objects in a new light. Photographed from a few centimetres away, even the most mundane objects become almost unrecognizable and can take on an interesting abstract quality. Look especially for subjects like these where all the important detail lies in a flat plane—depth of field is very limited at high magnifications*

than normal. This means that the focusing screen becomes dark, and the microprisms and rangefinder wedges may black out. Focusing must then be carried out using the matt glass part of the screen.

This darkening also affects the image on film, so when you are using extension tubes, you must allow some extra

exposure to take this into account. A TTL meter will automatically make the adjustment. When using a separate non-TTL meter, the extra exposure must be carefully worked out. The procedure for doing this is explained in the panel.

Automatic extension tubes retain all the normal functions of the camera with which they are used, but manual tubes may present some difficulties, particularly if the camera is fully automatic with no manual override. Since each type of camera has different characteristics, you should carefully read the instruction booklet before buying a set of extension tubes—particularly if they are not made by the camera manufacturer.

Movement and depth of field

Regardless of which method you use to take close-up pictures, depth of field is always a problem. As you get closer to your subject, it shrinks dramatically. At high magnifications, it is effectively zero, and the part of the subject that is sharp forms a flat plane—the *plane of sharp*

focus. This means that there is no margin for focusing error, and objects only a couple of millimetres in front of or behind the plane of sharp focus will be recorded on the film as a shapeless blur. Focusing must be done with great care and precision, and the lens should be stopped down as much as possible to maximize depth of field.

Subject and camera movement take on increased significance in close-up work, for this very reason. Not only does camera movement cause blur if it takes place while the shutter is open, but it can also throw the whole image out of focus. Moving the camera by a centimetre has little effect when a lens is focused on infinity, but it can render a close-up of a bumble bee totally out of focus. This makes a tripod essential for all but moderate close-ups.

A tripod can eliminate camera shake, but it can do nothing to stop subject movement. A slight breeze can blow a flower right out of the picture, and unless your subject is static, you should use the fastest possible shutter speed.

This in itself brings problems, because a fast shutter speed usually means using a wide aperture.

Since a small aperture is needed to give good depth of field, close-up pictures can present enormous exposure difficulties. The only simple solution is to load the camera with fast film, which allows both a high shutter speed and a small aperture. Electronic flash can help considerably, since it provides extra light and freezes motion, but the use of flash at short distances is in itself a fairly specialized technique, and a subsequent article deals with this.

Most of the problems with close-up work only crop up at high magnifications, or when a separate light meter is being used. If you have an SLR camera with through the lens metering, it is easy to take successful close-up pictures with the relatively simple equipment described here. All the pictures on the opposite page were taken with close-up lenses or extension tubes, and you can easily take equally effective pictures without even leaving your home.

Exposure compensation

All exposure meters which do not read through the lens are calibrated on the basis that the camera lens is focused on infinity. At closer subject distances, the lens is moved farther away from the film, and the light passing through the lens is spread over a wider area, so it is dimmer. This fall-off in illumination obeys the inverse square law (see page 254) so doubling the lens extension cuts the brightness to only a quarter.

Whenever the film-to-lens distance is increased to take a close-up picture, you must allow extra exposure to take this into account. Since close-up lenses focus closer without moving the lens farther out from the film, they need no compensation, but all other close-up systems do.

The necessary correction is affected not only by the lens extension, but the also by the focal length. To work out the correction, divide the total lens extension by the focal length, and square the result.

If you are not mathematical and use a 35 mm camera, you may find the chart below helpful. Set up your close-up picture, then place the chart in the subject position. Line up the right hand side of the panel with the right hand short side of the viewfinder frame, and you can then read off the compensation on the left hand side, either in the form of the number of *f*-stops by which the lens aperture should be opened, or an exposure factor, by which the exposure time should be multiplied.

You can also calculate the exposure compensation by measuring the total lens extension. Note, though, that this will not work with telephoto or retrofocus lenses.

Example

A 50 mm lens is fitted to a 30 mm extension tube to take a close-up picture, and the focusing mount of the lens provides some extra lens extension.

Since we cannot measure the lens-to-film distance directly, it must be worked

out indirectly. When the lens is focused on infinity, its extension from the film position is exactly the same as its focal length. The extra extension for closer subjects can be found by seeing how much the overall physical length of the lens increases over its length when focused on infinity. When focused on infinity, the lens extension must be the same as its focal length.

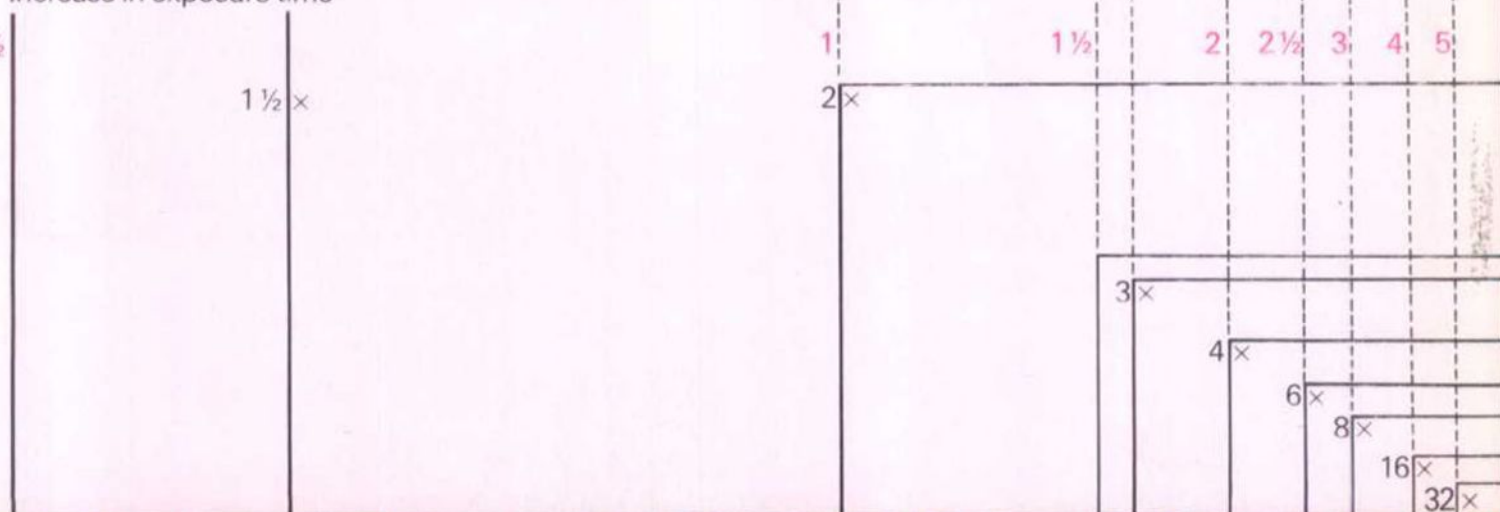
In this case:

Lens length for close up	= 48 mm (A)
Length at infinity	= 43 mm (B)
Subtract B from A	= 5 mm (C)
Extension at infinity	= 50 mm (D)
Extension tube length	= 30 mm (E)
Add C, D, and E = 5 + 50 + 30	= 85 mm
The total extension, then, is 85 mm.	
Divide this by the focal length	$\frac{85}{50} = 1.7$

Square the result to get the compensation $1.7^2 = 2.89$
The estimated exposure time should be nearly tripled.

Extra exposure required in f-stops

Increase in exposure time





Buying a movie camera-1

Still photographers often enjoy the extra dimension which movie making provides. Many different movie cameras are available so you should find out just what you need before you buy

Still photography and movies have a great deal in common and if you have a good eye for a still picture, you are at least halfway to making successful home movies. Although the terminology can sometimes be offputting, modern movie cameras for the amateur are generally easy to use, and anyone who can handle a sophisticated still camera should experience little difficulty with a movie camera. But it is important to choose the right camera.

Although there are larger formats available, by far the most popular with amateurs is 8 mm. Nearly all 8 mm

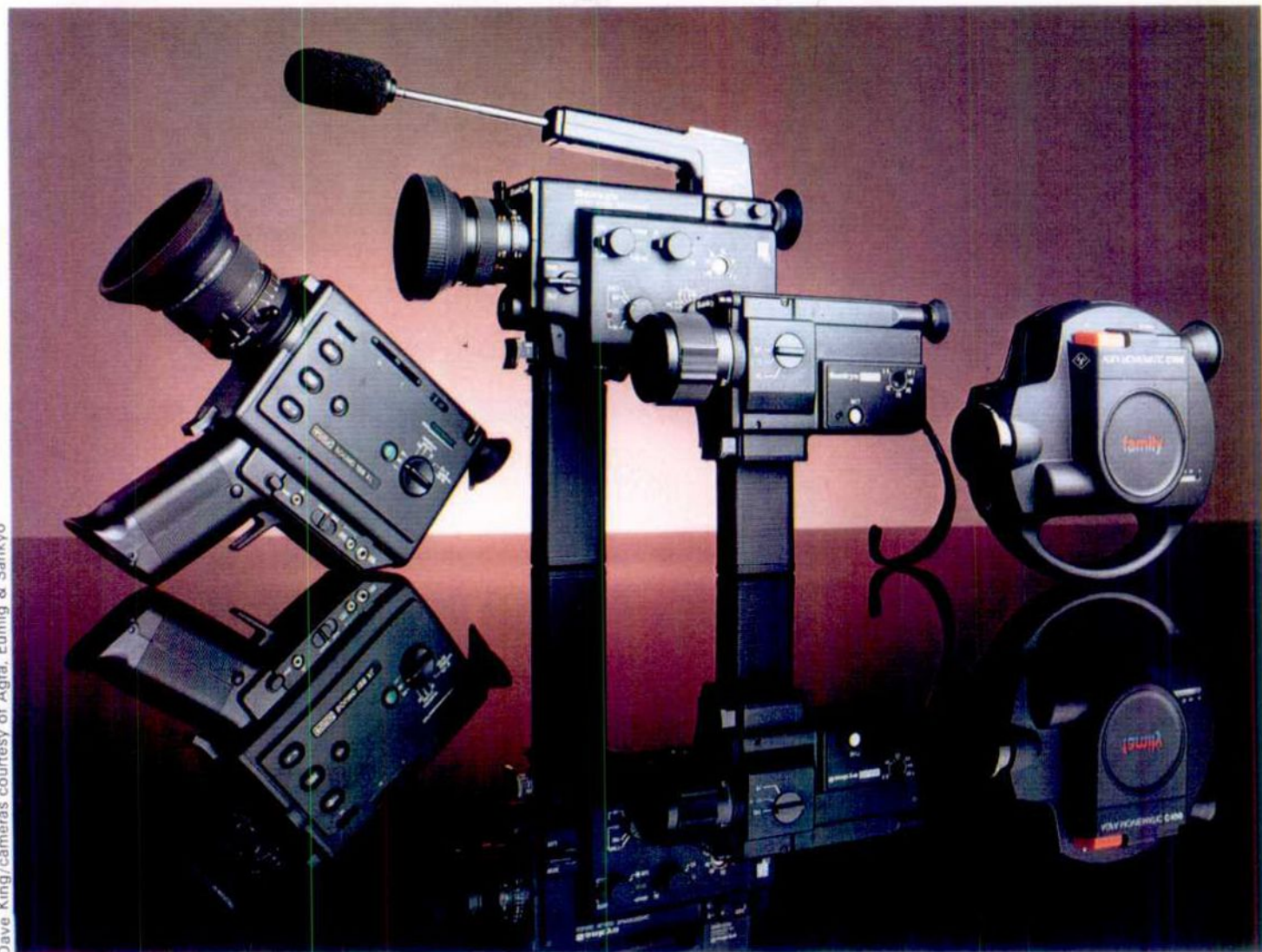
cameras use a film system known as *Super 8*, introduced by Kodak in 1965. Super 8 film comes in a light-tight plastic cartridge that can be loaded into the camera in a matter of seconds.

A 15 metre length of 8 mm wide film is coiled up in one side of the cartridge, with only a very short length visible through an opening at the front—just as with an audio cassette. When loaded, a sprung pressure pad presses the film against the camera's aperture plate. Exposed film is coiled up on a core alongside the unused film stock.

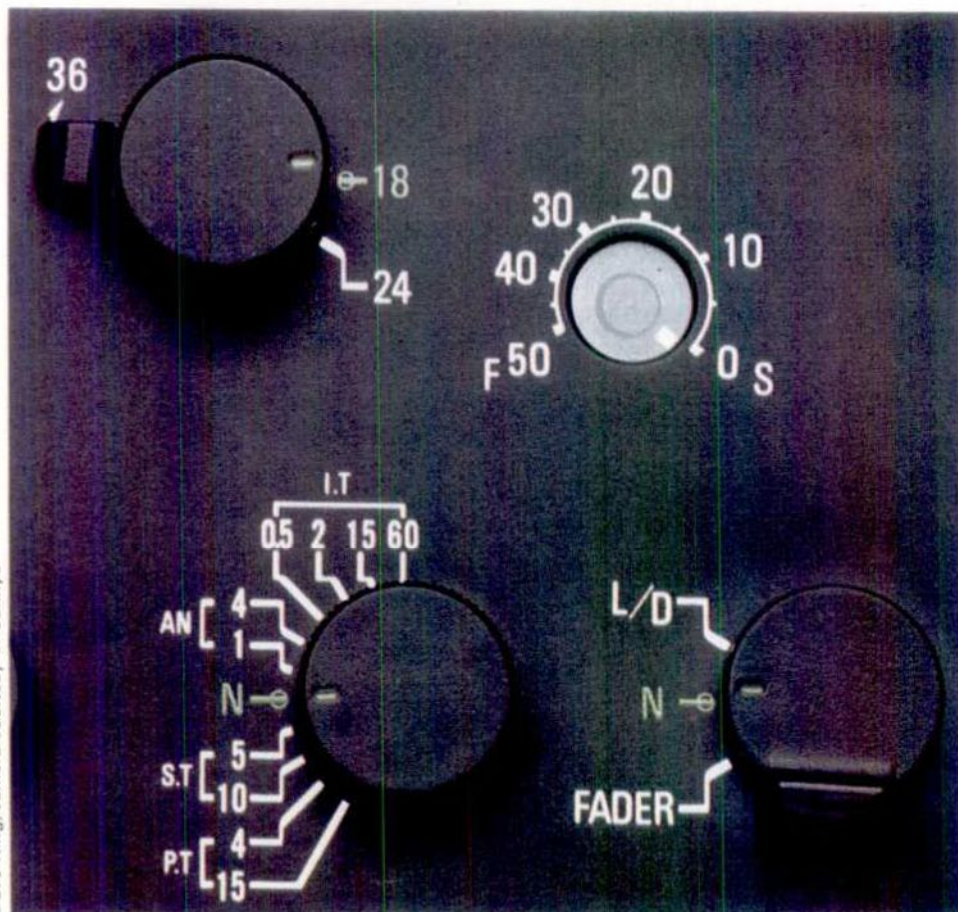
The standard cartridge gives a little

over 200 seconds filming time at standard speed, though, for some cameras, you can buy a larger cartridge that contains 61 m of film and gives about 13 minutes running time. This helps to avoid too many cuts which can make the film seem disjointed.

There is an alternative 8 mm format—the *Single 8* system launched in Japan by Fuji about the same time as Super 8 appeared. The format and dimensions of Single 8 are identical to Super 8, but the cartridge layout is completely different. Though the system has several technical advantages, it never really caught on.



Dave King/cameras courtesy of Agfa, Eumig & Sankyo



Range of control The more expensive cameras offer a great deal of control, such as extra filming speeds, fades, dissolves, interval timers for time lapse photography, self timers and so on. But such features are not vital, and if used only rarely, may not be worth the extra expense of the purchase price

Camera choice Cameras vary from very simple, fixed lens models with direct vision viewfinders, to sophisticated reflex models with zoom lenses. But the more complicated cameras are not necessarily the best choice—it is a matter of deciding which sort of camera is most suitable for the type of filming you wish to do

Both these gauges have superseded the older Standard 8 film that uses 16 mm wide film wound on spools in 7.5 m lengths, which has to be run through the camera twice, exposing one half of the width on each run; the film is then split after processing. While a number of people still use this gauge, no new Standard 8 cameras have been made for many years and it can be considered obsolete. Your choice must therefore be from among the wide range of Super 8s on the market.

When making your decision, it is useful to have some idea of the type of filming you are going to do because, unlike still cameras such as SLRs, most movie cameras tend to be sold as complete packages and it is harder to change the system later to suit a different approach. Lenses, for instance, are not normally interchangeable, and if the

fixed lens is not right for the type of filming, there is little you can do. It is important, therefore, to choose a camera with the right lens for your type of filming.

Lenses

Movie camera lenses generally have fairly short focal lengths—the standard is around 15 mm—giving good depth of field. But because of the small image size, their angle of view tends to be fairly narrow. The standard 15 mm lens, for instance, gives an angle of view only half that of the 50 mm lens on a 35 mm still camera.

Even the widest lens available takes in little more than the 35 mm format standard lens. You can buy wide angle adaptors for some movie cameras, but the angle of view given by the normal lenses is generally adequate since the narrower view encourages a larger camera-to-subject distance when filming people's heads and shoulders and so reduces distortion.

The most basic cameras have a fixed focus 15 mm lens with a depth of field great enough to ensure reasonably sharp focus from 2.5 m to infinity, even when the aperture is wide open. In bright light, with the lens stopped down, subjects as close as 50 cm will be sharp. But the versatility of fixed focus lens cameras is very limited and most modern Super 8 cameras have focusable zoom lenses.

Zoom lenses give considerable control over composition, allowing you to change from a frame filling head and shoulders to a full length in a single shot. The ratio of the maximum focal length to the minimum one can be anything from

2:1 to around 12:1, depending on the model. A large zoom ratio provides greater versatility. Most manufacturers produce a whole range of cameras based on a similar body, but fitted with lenses of progressively larger zoom ratios, with a corresponding increase in price.

Many cameras offer power zooming to give a smooth variation of focal length during a shot. On simple models the power zoom is achieved using the same motor that drives the film, so it is not possible to rehearse a zoom without running film (or unloading the camera). Most cameras use a separate motor for this purpose, sometimes with two operating speeds. For some shots it is better to operate the zoom ring by hand, to vary the speed or taper off at the end of the movement. This allows you to produce a less predictable result. But with a few cameras, manual zooming may be difficult—a point worth checking before you buy.

Until a few years ago, the maximum aperture for most movie lenses was $f/1.8$. Then Kodak introduced the concept of existing light (XL) cameras which, together with a fast film, allow you to film indoors by available light. This is achieved by fitting larger aperture lenses, often $f/1.2$ (or $f/1.0$) and making other changes to maximize the amount of light reaching the film. Good depth of field is maintained by the use of comparatively short focal length lenses.

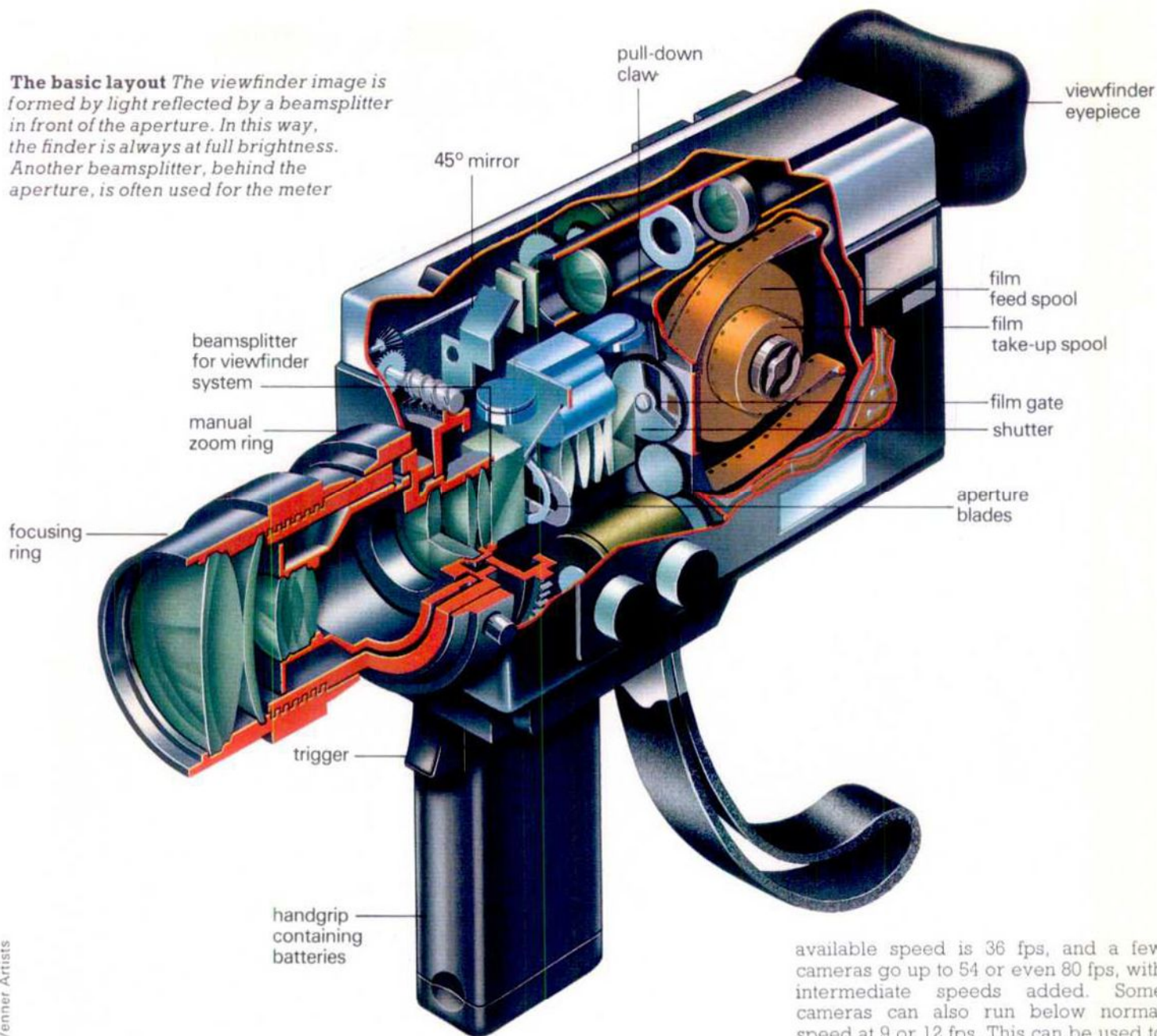
On lower priced cameras, the zoom ratio is usually around 2:1 or 3:1 (typically 12-24 mm or 10-30 mm) with apertures between $f/1.9$ and $f/1.2$. Large aperture lenses are available with zoom ratios up to 6½:1 (typically 7-45 mm $f/1.2$) though these tend to be rather heavy and bulky. Above this, to keep the lens size in bounds, maximum aperture tends to be $f/1.8$ for 8:1, 10:1 and 12:1 designs, though one maker produces a 6-90 mm, $f/1.4$ giant.

Viewing and focusing

Focusing techniques vary from lens to lens—it is a case of choosing which best suits your needs. Some lenses are fixed focus. Others shift the point of focus automatically as the lens is zoomed, to make the best use of depth of field. Both of these types are useful for 'snapshot' filming. Most lenses, however, are focused manually in the way familiar to users of SLR still cameras. There are also models with Automatic Focusing (AF) which set the lens for the nearest subject at the centre of the field. These work reasonably well and are specially useful in poor light, when visual focusing may be difficult, or when the distance of the main subject changes during the shot. But they add considerably to the bulk and weight of the camera. Because they can only operate over a limited range, most AF cameras are restricted to zooms with ratios of 3:1 or 4:1, though some 6:1 models are available. Of all the types, manual focusing is probably the most versatile, though the most difficult to use.

On fixed focus cameras, the viewfinder

The basic layout The viewfinder image is formed by light reflected by a beamsplitter in front of the aperture. In this way, the finder is always at full brightness. Another beamsplitter, behind the aperture, is often used for the meter



Verrier Artists

is of the separate type, displaced from the taking lens and similar to that on a 35 mm compact—sometimes called the Newtonian system. This can lead to parallax errors (see page 393) when filming at short distances from the subject. For safety, therefore, such finders tend to show less than will appear on the screen, but this makes composition difficult.

The vast majority of cameras use reflex finders that 'look' through the taking lens and eliminate parallax error completely. A reflex finder is essential with most zooms to show the field of view at any particular time. The view is always at maximum aperture, but there is often a considerable light loss in the viewing system. Photographers used to bright SLR viewfinders are often surprised by the dimness of a movie viewfinder. Compare several systems before buying.

On cameras with zooms more extreme than 4:1, it is often not possible to use the viewfinder image to focus by, because of the viewing system used. The viewfinder image remains sharp at all settings of the lens because the user's eye com-

pensates automatically. The subject distance must be set on the scale on the lens, which can be a slow process.

With greater zoom ranges, where focusing becomes critical at the longer focal lengths, and at close distances, it is usual to have a split-image rangefinder spot in the centre of the finder. To use these properly, it is imperative that the eyepiece is set correctly for the user's eye, so such cameras have dioptre adjustment available—see page 725.

Film transport

Whatever the gauge used, the film is advanced through the camera by a claw which engages in the sprocket holes. This pulls the film forward by one frame between each exposure. With this intermittent mechanism, the film is motionless during the actual exposure. All amateur cameras run at a standard speed of 18 frames per second (fps). But many also run at alternative speeds. By using a faster camera running speed, a slow motion effect will be achieved when the film is projected at the normal speed. This effect can be extremely dramatic if used with discrimination. A commonly

available speed is 36 fps, and a few cameras go up to 54 or even 80 fps, with intermediate speeds added. Some cameras can also run below normal speed at 9 or 12 fps. This can be used to give speeded up action on the screen. But it is more useful in very poor light for filming near-static subjects, as the shutter remains open longer for each frame.

Many cameras permit single frames to be exposed to allow animation of drawings or objects. Some add time-lapse facilities where single frames are exposed at pre-determined intervals, which can be continuously variable or at a set rate. This can be used to film very slow moving subjects such as sunsets, clouds, or growing flowers. However, in practice this facility is seldom used.

The trigger which operates the film transport and exposure is usually part of a pistol grip, which itself normally houses the batteries. Often the camera can be locked in the 'run' position. This facility allows the user to appear in his or her own films. To further aid this, some models include a delay of five or ten seconds before the camera starts.

Exposure

In order to simplify filming, virtually all Super 8 movie cameras are fitted with fully automatic exposure control. A photocell measures the brightness of the scene and adjusts the aperture accord-

ingly. In most cases the method used is of the TTL (through the lens) or the very similar TTA (through the aperture) type. This prevents the meter being fooled by very bright or dark objects outside the area being filmed.

Film cartridges carry coding notches which identify the speed and type of film in them. A feeler in the camera engages with the notches and automatically sets the film speed in the metering circuit. The change in exposure times for different running speeds is also allowed for automatically.

On the simplest cameras the user has no choice but to accept the automatic setting—there is only a warning in the finder if there is insufficient light to obtain good results. Many cameras have a backlight button that opens up the lens by about one stop for shooting against the light and in overcast weather when the overbright sky tends to give underexposed, dark pictures.

With the more elaborate cameras, a

given aperture can be memorized and held at the touch of a button, or, more often, any *f*-stop can be set manually. This can be useful for about five to ten per cent of scenes where unusual brightness distribution fools the automation.

The aperture scale normally appears in the finder, but sometimes it is external which is less useful. Usually there are also warnings for too little and too much light for proper exposure.

Some models have low light capability features—the time it takes for the film to be advanced by one frame is reduced slightly to allow more time to expose each frame. The shutters in such

Lens choice Simple lenses are often fixed focus and have low zoom ratios. The more common and versatile models offer focusing and high ratio power zooms. Many also provide the facility of focusing at very close distances, using a special setting on the zoom ring though zooming is not then possible

cameras are modified to give about a third of a stop more exposure than normal types. The effective 'speed' of XL cameras is also increased by reducing the amount of light diverted from the film to the finder and metering systems. In extreme cases non-TTL metering is used, and the finder takes virtually no light from the film, but is very dark as a result.

Film stock

The only film types which are freely available are reversal materials with a choice of two sensitivities—40 ASA (ISO) normal speed and 160 ASA high speed. This means that it is impossible to compensate for low light by choosing a very fast film, as you can with a 35 mm camera. Even if the film were available, the small film area would mean that the picture quality given by fast, grainy film would be unacceptable.

All Super 8 films have Type A balance (3400 K), for use with movielights and photofloods, and for producing good results with household lamps. For daylight use, an A-D (Wratten 85) conversion filter is built into the camera and can be swung into the lens, with appropriate (and usually automatic) exposure compensation.

Many older cameras are provided with sockets to take movielights, and when these are fitted the filter automatically retracts. Most recent XL cameras omit this fitting and have a small manual lever for positioning the filter. A valuable safeguard on a few cameras is a viewfinder signal to show whether the filter is in or out at the start of each shot.

One special colour film—Ektachrome 160 Type G—produces acceptable results under all lighting conditions without the use of a filter. This is coded on the cartridge by the absence of a 'filter' notch, and many cameras have a corresponding feeler that withdraws the filter when such a film is loaded.

Sound and other facilities

A large number of films now have a sound stripe (similar to normal magnetic recording tape) pasted down one side, for recording live sound. This is dealt with in a subsequent article, since the decision as to whether or not you want sound will greatly affect your choice of camera.

In addition to the facilities described so far, many cameras offer other features such as automatic fade (the image fading to total darkness during the shot—useful at the end of scenes) and lap dissolves (achieved by fading out at the end of a shot, partially rewinding, and fading in the next shot), and so on. With increasing use of microprocessors, more and more features are being incorporated, or even, in a couple of cases, sold as extras which can be added to a basic camera at a later date. You need to decide which features you are likely to need, and then find a camera with the appropriate combination to suit your photography.



Dave King/camera courtesy of Sankyo

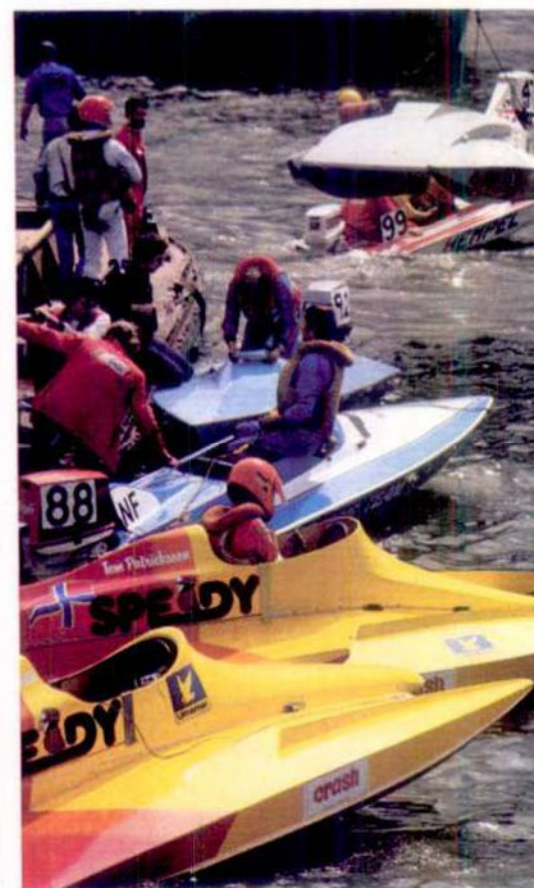
Assignment

Power boat race

Speed, colour and spectacular action are features of powerboat racing, and are ideal ingredients for taking a series of dramatic pictures



Nigel Snowden



At speed Overlooking the course from a dock wall and using an 85 mm lens gave this frame-filling action shot

Inshore powerboat racing has established itself as one of the most popular sports and offers all the glamour, colour and excitement of motor racing, together with the spectacular action of a fast moving water sport. In addition, many of the races take place on rivers or in docks in the hearts of large cities, presenting an excellent setting for photography.

Like all other sports, photographing a





Nigel Snowden



Winner's helmet The 85 mm lens was also useful for isolating small details in the pits **Start** A side view is effective for photographing a start, but you need a fairly long lens—here 180 mm **Out of the turn** Working from a distance, Nigel found that he needed a 400 mm lens for this action shot

packing the right lenses to cope with planned viewpoint. For the powerboat race, he decided to take along both his 300 and his 400 mm lenses—long telephotos are essential. Using anything shorter may mean that shots which looked impressive through the viewfinder when the action was at a peak end up on film as relatively small, uninteresting specks in the water.

However, as far as long lenses are concerned, Nigel points out that it is one thing to have the right lens for the job, but quite another to make good use of it. In the excitement of the race, it is easy to work carelessly and to end up with poorly focused or soft image shots caused by camera shake.

Nigel uses a monopod to support his longer lenses, but this only solves half the problem. Focusing on a fast moving object requires skill and Nigel advises to always aim to keep the cockpit sharp. 'To get a driver's head in focus when he's moving towards you at speed, focus two or three metres in front of him—say on the nose of the boat, and shoot straight away—this will allow for the reaction time.' Another useful technique is to prefocus on an object close to where the boat is expected to appear—say on a buoy, marking the point where a boat will make its turn. Photographing fast moving subjects is largely a matter of hit or miss and it is relieving for the amateur to know that even the pros expect to have a few unsharp results.

To freeze the action with a long lens, you need to use a shutter speed of at

powerboat race requires plenty of planning together with a degree of knowledge about the event. Background research should include looking at photographs which professionals have taken over previous years and studying the course beforehand. You may, for instance, discover that it would be easier to get the type of picture you want in the relatively uncrowded, more relaxed

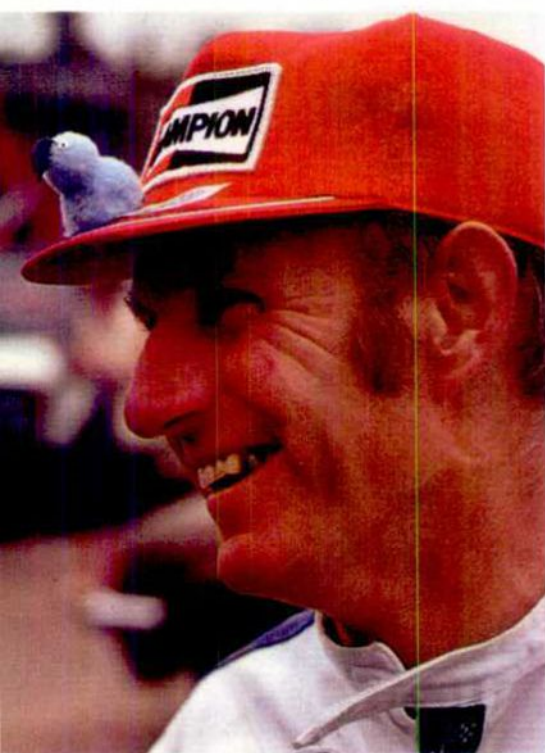
conditions of practice day, than waiting until the race day itself. Similarly you may find that taking something to stand on gives a greatly improved viewpoint.

As a professional sports photographer, Nigel Snowden is used to putting plenty of work into the preparation for an event—whatever the sport may be. This also involves working out the sort of shooting distances that will be necessary and



Nigel Snowden

Wrong direction For a more unusual view of a start, a 16 mm full frame fisheye was used. The main area of interest is the foreground where a boat has been turned by the wind **Side view** Panned shots must be taken at slower shutter speeds. Nigel advises against speeds slower than 1/125 sec



Nigel Snowden

least 1/500 second. This will prevent camera shake and freeze the movement of the spray in mid air. Nigel also took some panned shots, and for these he used a medium telephoto such as a 185 mm. For action shots taken at fast shutter speeds it is usually necessary to shoot with the lens at maximum aperture. This makes focusing all the more critical but has the effect of isolating the main subject from its background.

Professional photographers who are

used to shooting this type of action find that instinct and quick reactions are often as valuable an asset to gaining great shots as meticulous technique. So, while it is valuable from the amateur point of view to analyze carefully how to get the best results by basing your photography on sound techniques, do not become so preoccupied with this that you neglect the opportunity to grab spontaneous shots when the action allows little time for thought.

The camera in medicine

Using a variety of special photographic techniques and equipment, medical photographers can produce spectacular pictures for recording, teaching and diagnostic purposes

Much publicity has been given to the dramatic pictures scientists can now take of the human body. A combination of computers, video and radiation can give glowing pictures of the human brain or images of a baby in the womb. But, almost unnoticed, backing up these spectacular displays is the medical photographer whose work is vital to the smooth running of the medical profession.

Most hospitals have medical photographers on their staff; without them doctors would not know what many diseases looked like, case notes would be much less clear, some conditions would go undiagnosed and the number of operations would increase.

A hospital's medical photographer has to be both a jack of all trades and highly specialized. He may be called on to provide any photographic service at a moment's notice, from taking a picture of an award winning consultant to photographing a new kidney machine for an appeal. However, the bulk of his work is more directly involved with medicine.

Medical photographers have adapted fibre optics to take pictures inside the body and have improved camera measuring techniques to make maps of its surface. They use infrared and ultra-violet light to make clear medical conditions which are invisible under normal light, and polarized light is used to colour living tissues under microscopes. Retinal cameras have also been



Kitrosser/Atlas Photo

developed to take pictures of the inside of the eye and ring flashes have been introduced to provide even light in close-up pictures of body cavities.

Clinical photography

This is the bread and butter work of medical photography, and covers the whole range of photographs of clinical

X rays Doctors can obtain excellent pictures of a patient's skeleton using radiation. But many diseases can only be recorded by the medical photographer

conditions which are taken for medical records and teaching purposes. Many medical students will only learn about more obscure diseases through these pictures, and they also give doctors a visual record of how a disease has progressed.

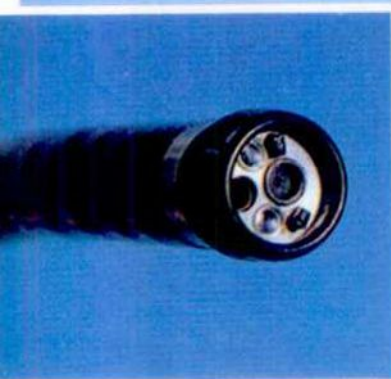
As they are used for exact records, clinical photographs have to be incredibly precise. If, for example, photographs of a particular patient are taken over a period of 15 years then the only thing that can be allowed to change is the patient. The lighting conditions, camera position and the colour must all remain identical.

Photographers usually buy a year's supply of film at once and store it in a fridge to try and maintain the same colour balance. They will also carry out constant test shots of colour reference charts with every roll to ensure that the processing is accurate and that the colour balance of the lights has not changed. Gelatin filters may then be used on the lights or camera to correct any imbalance.

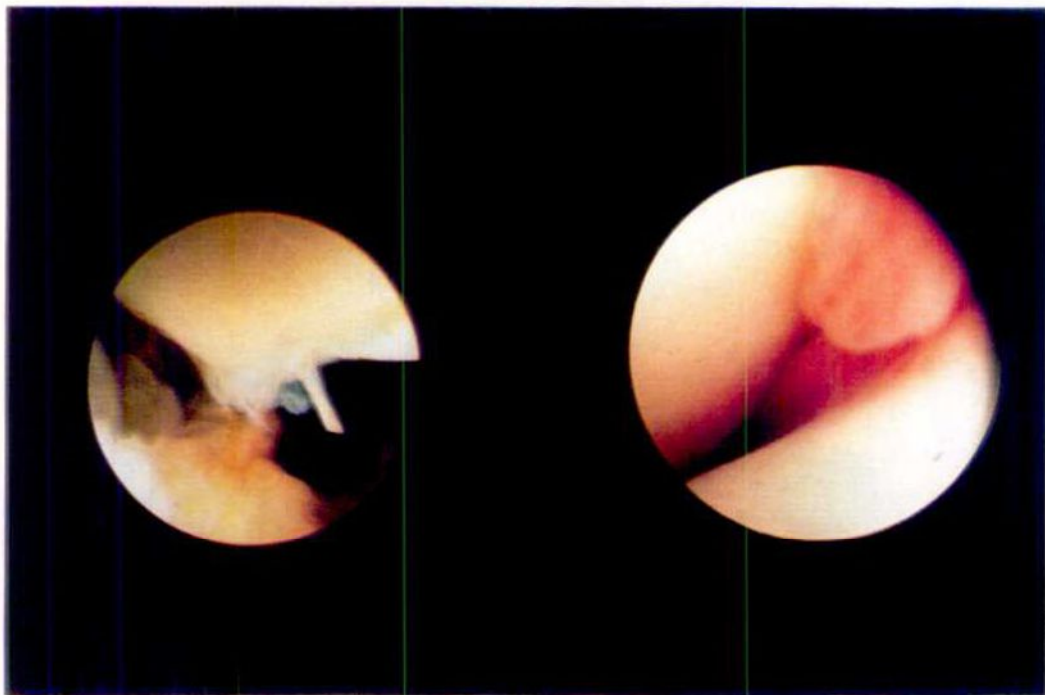
There are also precise specifications for the photography itself. The positions of the lights are recorded and filed with the patient's case history and lighting is adapted to suit the subject being photographed.



Endoscopy The endoscope owes much to the developments in fibre optics during the 1960s. The large picture shows the proximal, or doctor's end of the apparatus. Inset is the distal end, which enters the patient's body



A. R. Williams



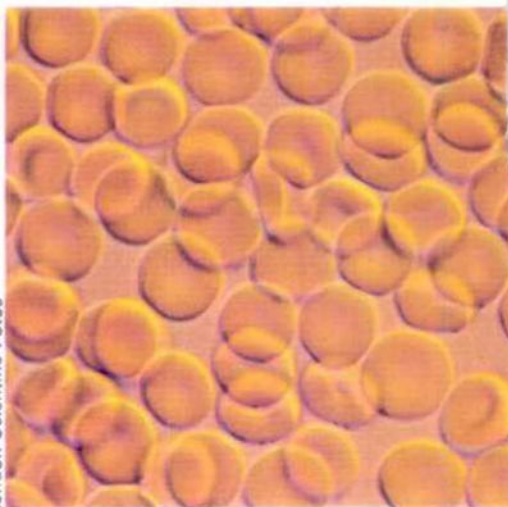
Photomicrography

Taking pictures through a microscope is a regular part of the medical photographer's work, and though it may sound a fairly easy process, it is one of the most complex branches of this field.

To begin with, the normal relationship between film, lens and subject is reversed. In general the comparative distance between the lens and the subject is very great, while that between the lens and the film is very small.

Inside the body These pictures, taken with an endoscope, show a damaged cartilage in the knee (left) and a polyp, or benign outgrowth of tissue (right)

Photomicrography Human blood cells magnified around 3000 times



Although clinical photography is a major part of medical photography, it employs a fairly basic range of skills. It is only when photography is used as a diagnostic tool that a wider range of techniques is brought into play.

For this kind of photography the most important techniques are those using infrared and ultraviolet light, endoscopy, photogrammetry and photomicrography.

Seeing inside the body

Increasing miniaturization has made the innermost recesses of the body accessible to the camera. Whereas surgeons used to open up a patient simply to see what was going on, the endoscope now allows them to see inside the body.

The modern endoscope, consisting of 1200 tiny fibres in a bundle no bigger

than a pen, is pushed down the throat of a lightly anaesthetized patient. The fibres carry light down, and transmit photographic images back at the same time.

Although increasing use is now being made of television cameras in endoscopy, the medical photographer is still called in if a surgeon wants a particularly good set of pictures for a book or for training purposes.

The main problem with this technique can be the low light levels. It is quite common to use 400 ASA film uprated to 3200 ASA, despite the use of arc lights or very powerful halogen lamps.

Endoscopy is an example of medical photography making a major contribution to health. Its introduction into hospital routine has dramatically reduced the number of operations.

Shooting through a microscope, however, the opposite is true. As a result, stopping down the lens actually gives worse resolution and depth of field.

Photomicrography often involves working with low light, but since the subject does not move, long exposures can be used. However, this also causes reciprocity failures, which need compensation.

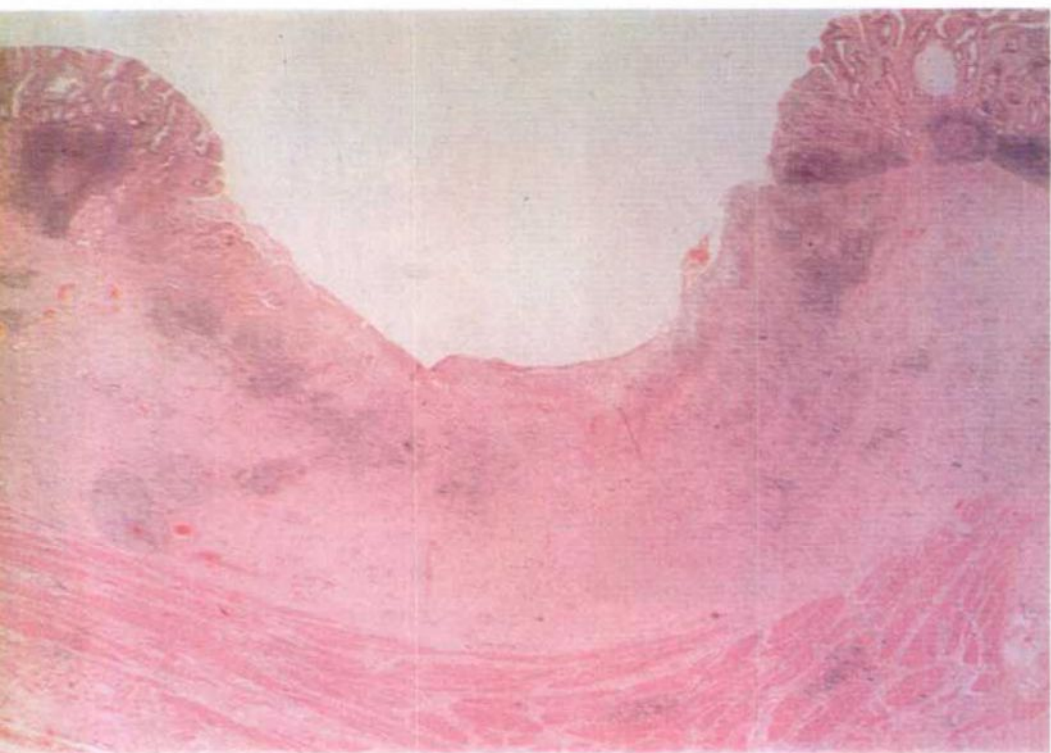
A specimen on slide can be illuminated by reflected light, in the same way photographs are normally taken, or more commonly by *transillumination*, which means shining the light through the subject.

Transillumination is by far the best way to see all the detail on a slide that might be only a fifth of a millimetre thick, but it causes problems with lighting. The most serious of these is flare—that is, light that does not contribute to forming the image.

To remove non image forming light, the light coming up from underneath is focused through a system of lenses that almost exactly match those on the camera.

Transillumination The light source was placed underneath the specimen for this photomicrograph of a section through a gastric ulcer

Clinical photographs Two pictures of skin complaints under flat lighting



A. R. Williams

London Scientific Fotos

R. A. Price/Norwich Park Hospital/London Scientific Fotos



A. R. Williams/Charing Cross Medical School/London Scientific Fotos



Photogrammetry

Photogrammetry involves using the camera as a measuring instrument. The simplest application is in forensic science, where a picture is taken of the scene of a crime under tightly controlled conditions.

Markers are placed on the ground and the distance from camera lens to film is precisely noted. A metre square is laid in the middle of the area, which is reproduced in the picture as a parallelogram. Pictures taken under such conditions can then be used at a later date to reconstruct events using the markers and scaling up. This technique is often used to reconstruct the speed and positions of cars at accidents from the skid marks. It is obviously more convenient to work on a picture than on the ground where the site has often to be quickly cleared up.

Slightly more complicated is the use of a camera to produce 3D contour maps of an object. This can be done using a technique known as *light-sectioning*.

To visualise this, imagine a woman standing in front of you. A very thin bar of light, shone at her from the side, illuminates all the points on her body that are, say, five centimetres from her back-bone. Another bar, five centimetres nearer you also shining at her from the side, illuminates all the points ten centimetres from her back-bone, and so on. In this way, using a grid of

Photogrammetry By placing a slide composed of coloured lines over the light source, a multicoloured light section is produced (left). The contour map (right) was drawn up using stereophotogrammetric techniques

narrow slits, a contour map of the body is highlighted and photographed.

Photogrammetry was originally developed to make maps of the ground from balloons and then adapted in hospitals by medical photographers to solve the problem of measuring the volume or surface area of something as irregularly shaped as the human body.

Another photogrammetric technique is that known as *moiré topography*. A grid consisting of thin vertical wires is placed close to the subject and between the subject and the camera. A light is shone on to the subject from an angle, through the grid. On a smooth surface, the grid and its shadow would match. Any lumps and bumps, however, will show up, producing a pattern that reproduces the contours of the subject.

An even more complicated photogrammetric technique is *stereophotogrammetry*. This involves taking two pictures simultaneously with two very carefully fixed cameras, rather like a pair of binoculars. The developed pair of photographs is then projected back through the lenses of each camera on to

a table that can be raised and lowered.

Those points where the two images coincide at any given height of the table are the points that were equidistant from the camera. By gradually raising the table and watching which points come in to focus, a contour map can be drawn.

During pregnancy there may be problems with breathing because the growing baby changes the relative volumes of the chest and the abdomen. Photogrammetry was also used by NASA to check whether the bodies of returning spacemen had suffered any changes in shape. It is almost impossible to measure these changes in other way.

Infrared photography

The main uses of infrared light are to reveal elements in the body in a way which cannot be seen by the naked eye.

Thermography *The medical photographer may be asked to take pictures of the images formed by a thermograph. Such pictures will be used as records*

This is because some objects reflect infrared light in different ways to the manner in which they reflect normal light. Infrared light can detect carbon particles on smoke-blackened lungs, show blood vessels near the skin, or reveal the iris of the eye behind a cornea, invisible in normal light.

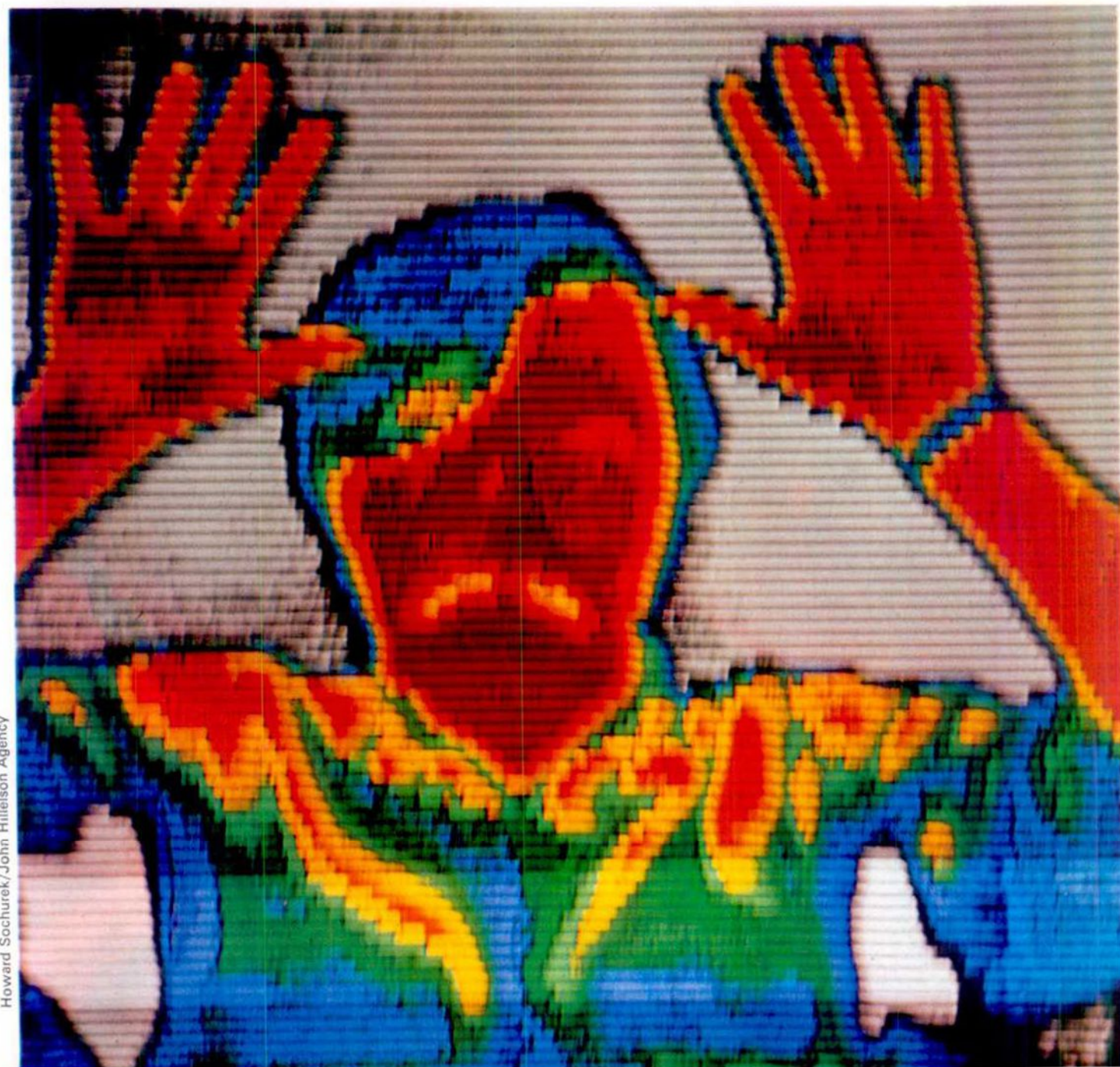
Most light sources contain infrared radiation and so almost any light source can be used. In hospitals the most common is an electronic flash. High speed infrared film is used for black and white photographs, with a filter over the camera lens which cuts out visible light.

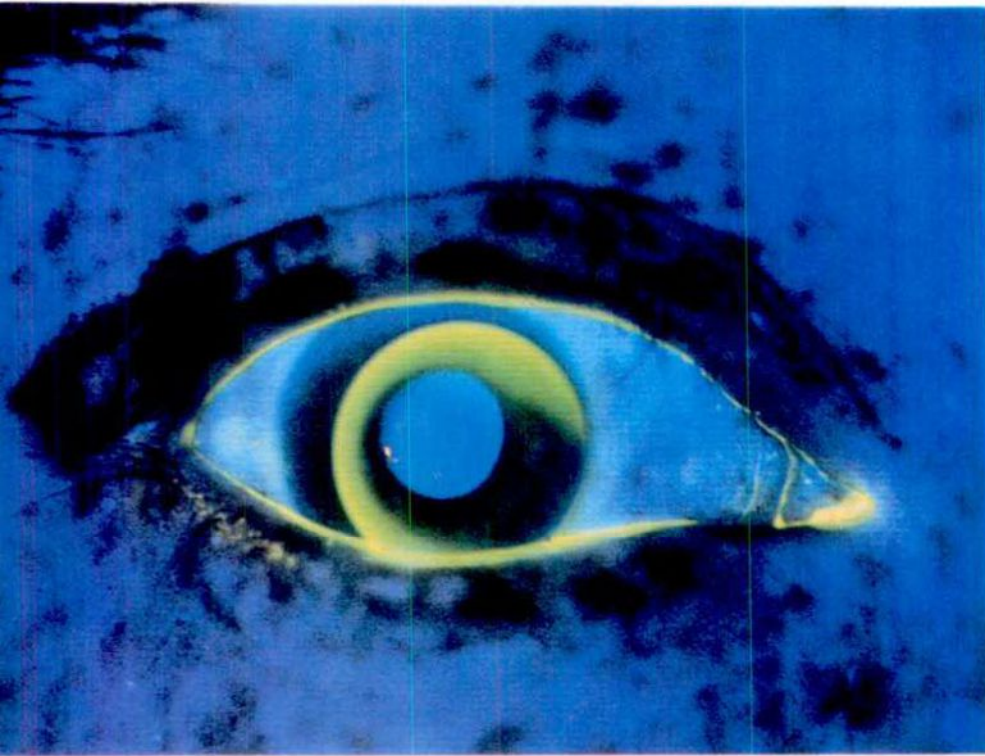
Infrared photographs on colour film can produce dramatic results because the emulsion layer that normally corresponds to purplish-red light has been made sensitive to infrared. This falsely-coloured magenta layer produces bizarre colour combinations with the other two layers in the film—cyan and yellow. Colour infrared photographs can turn caucasian skin green and green grass to red.

The other useful feature of infrared is that it can penetrate human tissue by a few millimetres. This is not as much as the penetration of X rays, but combined with the fact that blood absorbs infrared light more than skin, it is useful for examining superficial veins and arteries. For example, the veins in the hands and legs of diabetics have a tendency to close up and turn gangrenous. Using black and white infrared photographs, doctors can keep an eye on this tendency and treat it when it appears.

Ultraviolet photography

The principle of ultraviolet photography is similar to that of infrared except that it has opposite qualities. Even ordinary light may penetrate the surface of the skin by a few microns (a micron is a millionth of a metre) causing a slight blur in extreme close-ups. But ultraviolet light bounces right off the surface, so in these conditions it will produce crisp, contrasty images. Consequently it is widely used in photographing skin





A. R. Williams

complaints since every detail shows up clearly.

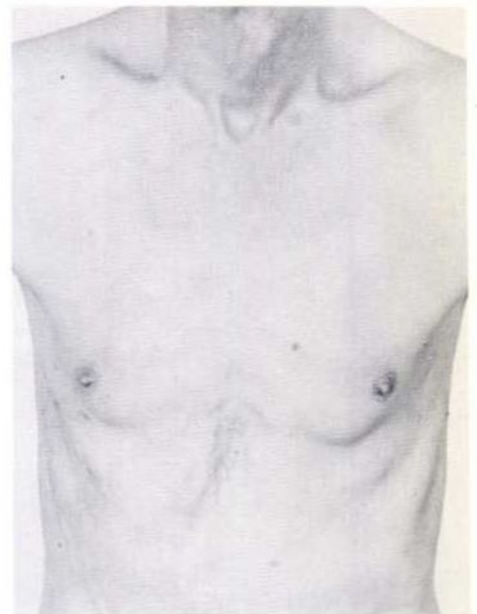
Although ultraviolet light does not penetrate the skin it is absorbed by a skin pigment called melanin, which is the element that makes light skin go brown under the sun. Under ultraviolet light melanin always shows up dark even on untanned skin. In caucasians, this serves as an early warning of skin cancer, which is when cells containing too much melanin begin to multiply uncontrollably.

Ultraviolet can also be used to detect one of the side effects of birth control pills, when melanin becomes unevenly distributed over the body. This is not noticeable on untanned skin, except under ultraviolet light.

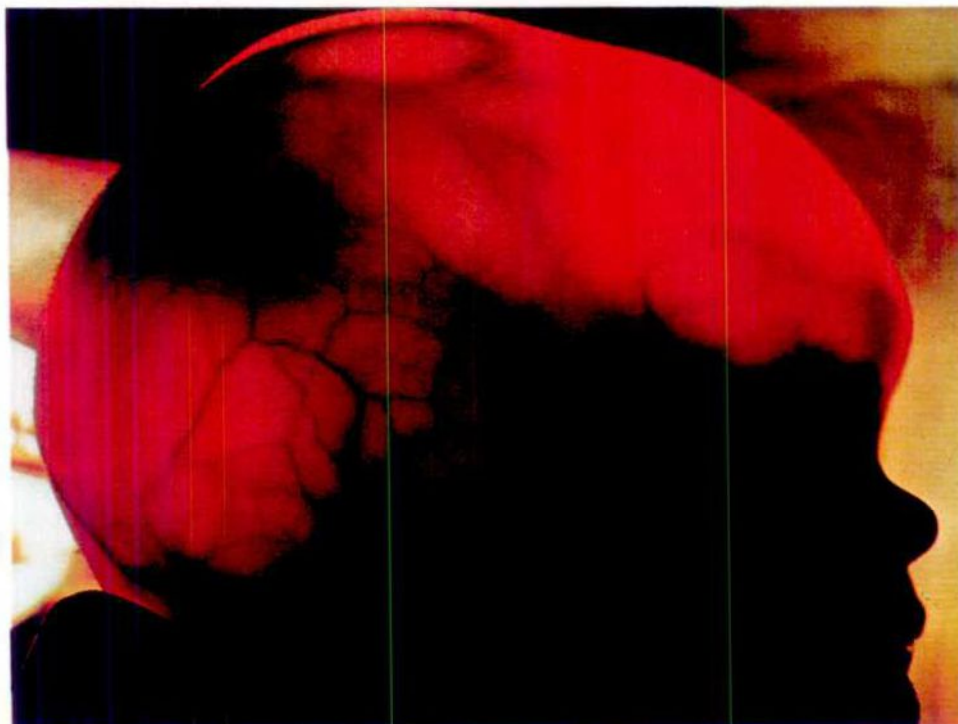
Ultraviolet Drops of fluorescein placed in the patient's eye reveal a crooked contact lens under UV light

Thrombosis Infrared light shows up veins invisible under normal light

The principle of taking ultraviolet pictures is similar to that of infrared photography. Again, a light source containing ultraviolet, usually an electronic flash is used, and a dense filter is used to screen out all visible light so that all that is visible through the lens is a dark blue glow. The discharger tubes in modern electronic flashes are often coated with a thin layer of gold to suppress ultraviolet light, so hospitals usually order their flashes uncoated.



A. R. Williams



A. R. Williams

Medical photographers generally use ordinary black and white film as this will show all the detail they need.

The other value of ultraviolet is that it causes certain materials to fluoresce, which is the effect you can see in some dance halls where teeth and white shirts glow in the dark under a UV lamp. If a patient is injected with the dye fluorescein, photographs can be taken of their eyes showing every vein, artery and capillary of their retina in incredibly fine detail. These will reveal any blockages or seepages of blood.

These photographic techniques are supplemented by a wide range of imaging techniques where patterns and images are recorded by scanners and appear on a video-screen. Photography has contributed enormously to advances in medical care, supplementing teaching and research as well as everyday diagnosis and treatment.

Baby's head Water on the brain was revealed by this photograph. A strong light was shone through the subject



Special effects filters

You can add colour and sparkle to brighten up a dull or lifeless picture with special effects filters. But for the best results, they must be used carefully and selectively

Special effects filters are no longer the exclusive preserve of the professional photographer—they are now widely available in apparently endless variety, at a price that any amateur can afford. Because they are so cheap and easy to use, there is a great temptation to buy half a dozen of them, and use them as often as possible, but this generally results in a collection of mediocre photographs, all of which look remarkably similar to each other.

The real skill in using any special filter is to use it appropriately and sparingly. The effect a filter produces should enhance a picture, not overpower it—just as an accompanying pianist complements a singer.

Graduated filters

The most straightforward and useful type of special effects filter is the graduated filter. This is simply a piece of

glass or plastic that is half clear and half coloured. The boundary between the two halves is not abrupt—the two areas blend together. Graduated filters are made in neutral grey, and in a wide range of other colours. Some manufacturers make them in two different densities—the coloured half is available as either a pale colour or a deeper one.

Although graduated filters are available in the usual circular mounts which screw on the front of the lens, you can also buy a more versatile version, which takes the form of a square of plastic and a special holder. The filter can be slid up and down in the holder, and rotated (see page 577). This makes it possible to line up the boundary between the clear and coloured areas with any feature in the picture.

Graduated filters are most often used to darken the sky, or to change its colour. Because the sky is so much

brighter than the rest of the picture, it is usually overexposed on colour film. A graduated filter can cure this, without cutting out light from the rest of the scene. By using a grey filter, the sky on a sunny day is recorded as a deep blue. Without a graduated filter, it often appears pale and weak. The paler of the two densities of grey produces a moderate darkening, but the dark grey graduated filter gives a very dramatic effect—rather like a tropical sky, or an early morning deep blue sky.

Coloured graduated filters can also be used with a blue sky. A blue filter can make the sky a richer shade of blue, but other colours can also be very effective. A yellow filter, for instance, can drain all colour from the sky, making it an ominous slate grey. By combining it with a polarizer, you can turn the sky almost black, without affecting the foreground of the picture.

Some photographers rotate the filter so that the darker half covers the foreground, and then take an exposure meter reading from the sky to determine the exposure. This technique gives great detail in the sky, and renders the ground as a dark, featureless shape—a useful way of dealing with distracting foreground detail if you want to take a series of cloud pictures. Generally, however, exposure meter readings are taken in the normal way when a graduated filter is in use. The filter only cuts out light from the sky, so if anything, it should improve the accuracy of a TTL meter by preventing it from being too strongly influenced by the sky.

When you are using black and white film, graduated filters can improve a picture which includes the sky. Red and orange filters are often used to give very dramatic skies, but they have a number of disadvantages—first, they absorb a lot of light, sometimes as much as three stops. Second, since they strongly absorb blue light, they tend to deepen the shadows in a sunlit scene which are illuminated by blue light from the sky. This increases the contrast, and pictures taken on a sunny day with a red filter can

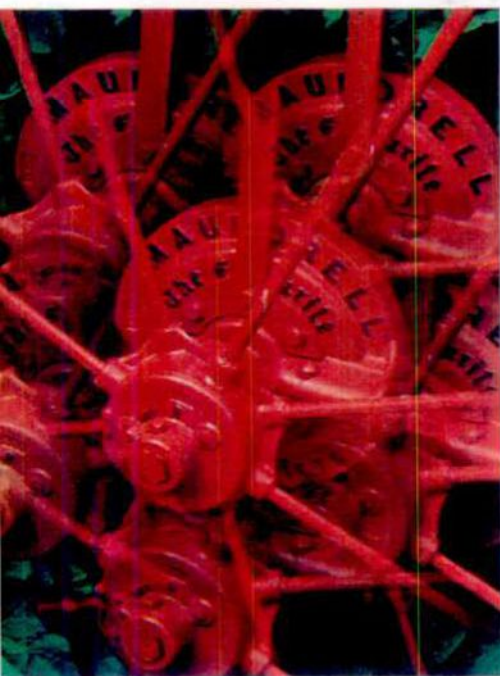
Bob Croxford

Eastern dusk Used with subtlety, effect filters can transform a picture.

Here, two graduated filters were used to darken the sky and the water

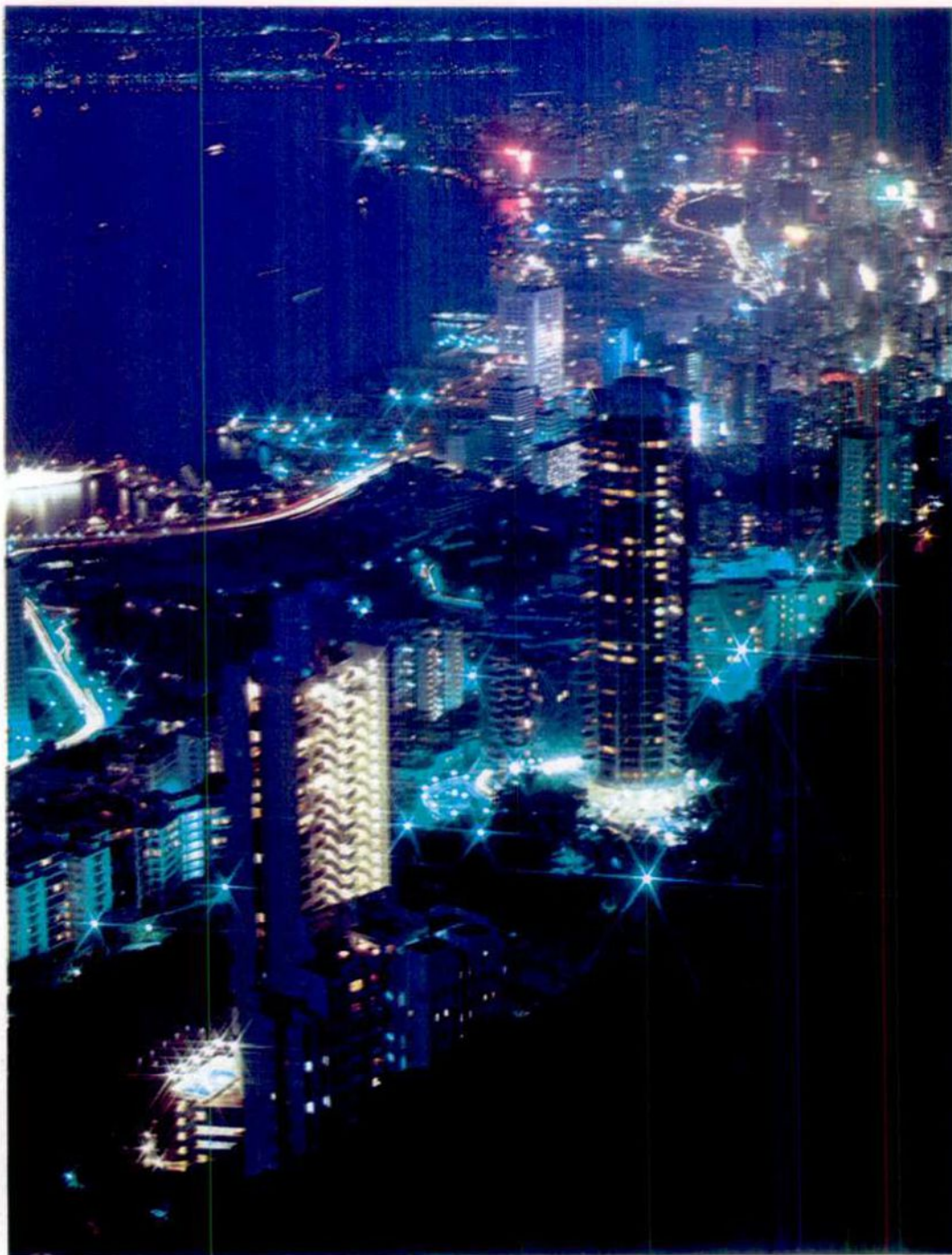
Twinkling city A starburst filter greatly improved this picture of Hong Kong, without totally dominating it

Cartwheels Prismatic attachments can sometimes be used for novelty value



be very difficult to print. A graduated orange or red filter gets round both these problems, because it only acts on the sky, and does not increase the contrast of the foreground scene, or cut out any light from it.

If you use colour negative film, and do not print it yourself, a grey graduated filter allows you to get better results



from an enprinting or machine printing service (see page 639), by effectively 'burning in' the sky at the camera stage. As with colour transparencies, this gives a deeper, richer blue to the sky.

On dull days

Photos taken on an overcast day usually have blank white expanses of sky lacking in interest. Although a blue graduated filter will not produce a convincing blue sky from an overcast one, other filter colours can be used very effectively to relieve the monotonous expanse of low cloud. This is particularly useful with wide angle lenses, which tend to take in more of the sky than longer focal lengths.

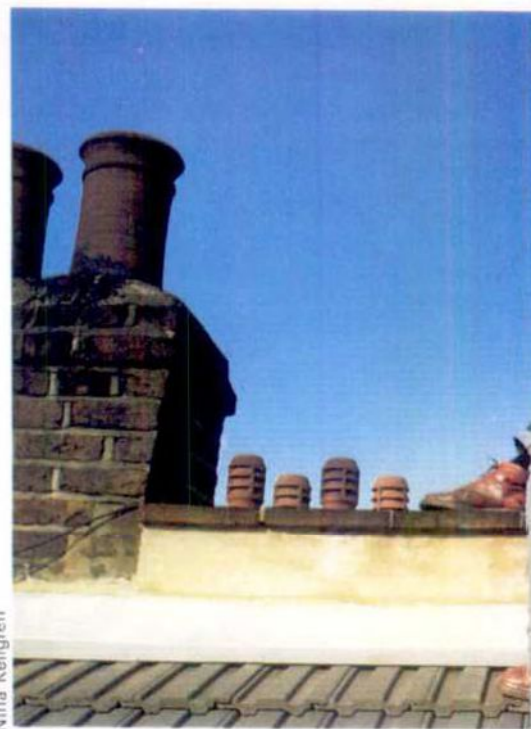
Graduated filters have uses other than darkening or colouring skies. Grey graduated filters can be useful for flash pictures. By positioning the dark portion over the foreground, the falloff of

illumination with distance can be reduced, giving more even lighting. Because a graduated filter is placed close to the lens, the area of blending between the clear and coloured portion does not appear sharp in the final picture. The exact degree of unsharpness, however, depends on the focal length of the lens being used and on its aperture. Long focus lenses have very little depth of field, so if you are using a graduated filter at full aperture on a telephoto lens, the area of blending is almost imperceptible. On the other hand, an ultra-wide angle lens forms quite a sharp image of the boundary. The only way to avoid this is to use two of the weaker graduated filters, and overlap the areas of blending to give a more gradual boundary.

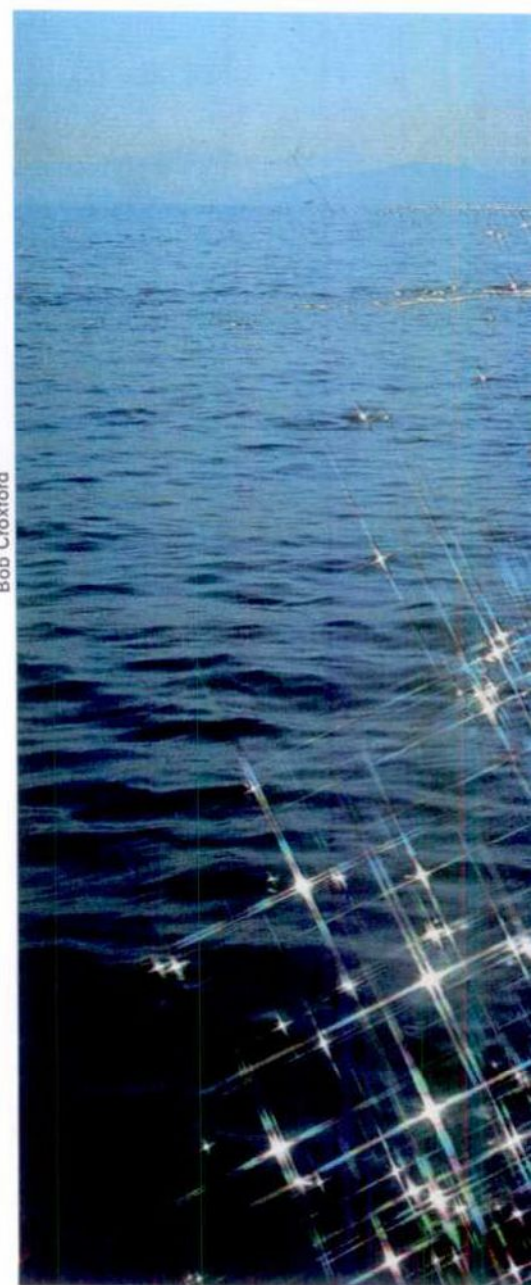
Whichever lens you use with a graduated filter, the working aperture has a great bearing on the effect pro-



Nina Kellgren



Bob Croxford



duced, and if you are using an SLR that has depth of field preview, always use this to examine the final result.

Starburst filters

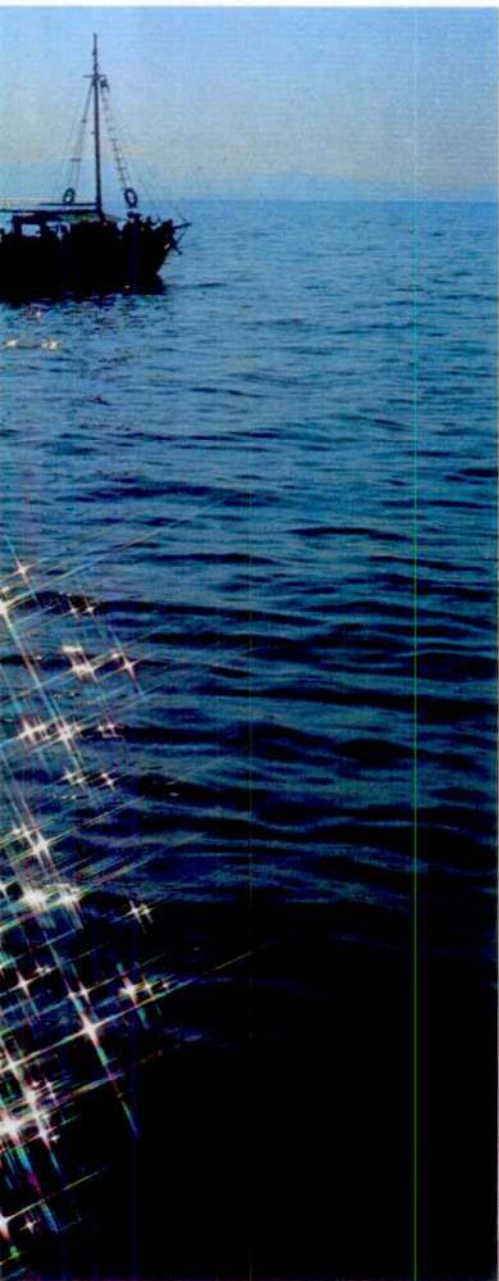
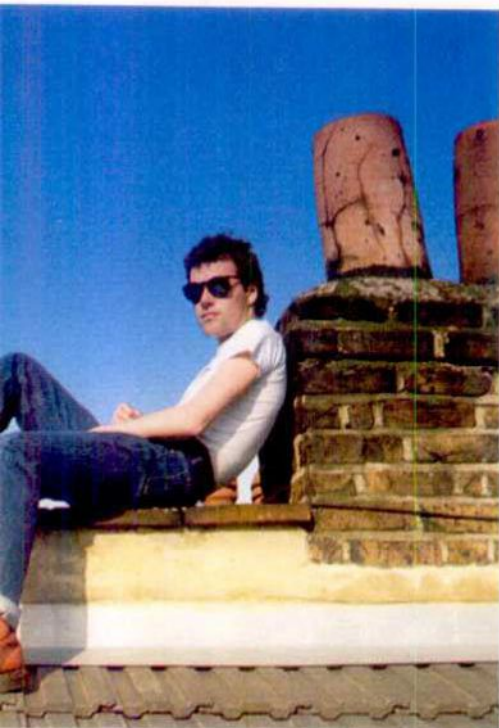
Graduated filters are more useful for general daytime photography out of doors, but starburst filters come into their own in the studio, or outside at night. Starburst filters produce bright multi-pointed streaks of light from every highlight in a picture, pointing outwards away from the light source. This makes them ideal for adding an extra sparkle to the highlights in a night scene, making streetlamps and windows twinkle like stars. For a still life in the studio, a starburst filter can make jewellery, glass and metal highlights flash with light, instead of just having burnt out highlights.

These filters are made in a number of different versions, giving anything from two- to sixteen-pointed stars. By combining two or more filters, you could

Dark skies Graduated filters are most useful for adding interest to a dull sky, either by making it bluer, or by giving it a stormy look. Take care if you are using a wide angle lens, or the boundary zone may be obvious

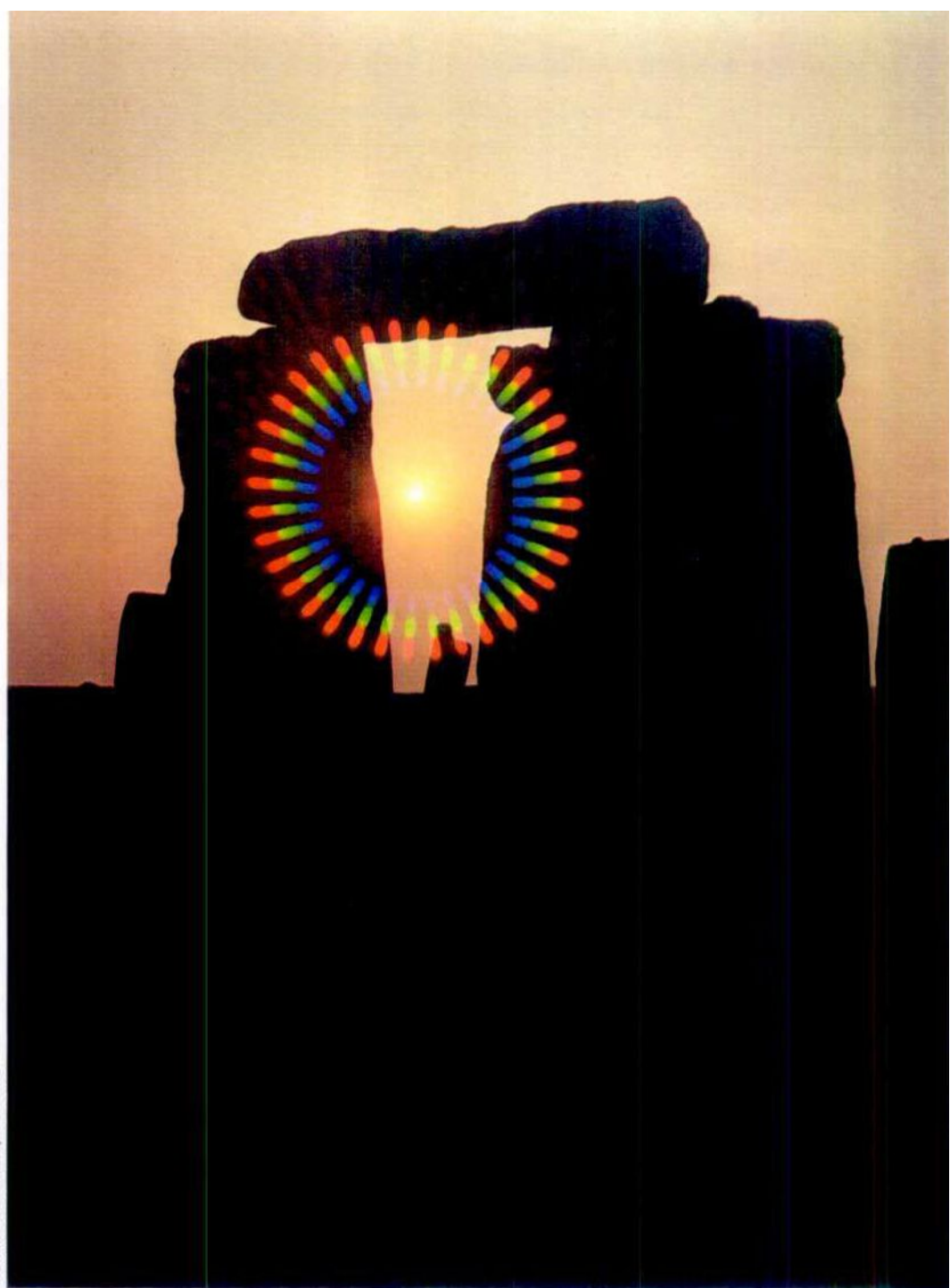
theoretically have unlimited numbers of points on each highlight. Unfortunately, this is not possible in practice, because of the way that starburst filters are made. The 'stars' are produced by minute lines on the surface of the filter. They are either scratched on to plastic sheets, or scribed with a diamond on to glass. The effect of this is similar to a scratched lens, and not only do you get starbursts, but you also get flare.

Glass filters have narrower, more precisely scribed lines, and produce only a little flare, but scratched plastic filters form a veiling fog that obscures fine detail in a picture, and fills in shadow detail. Try and use starburst filters only in pictures where a misty,



Richard Passmore/Colorific

Julian Nieman/Susan Griggs Agency



Add a sparkle Starburst filters produce a pattern of brilliant daggers of light whereas diffraction filters give rainbow coloured circles or spots. Both work best if there are light sources or bright reflections in the picture

romantic mood is required. They work best where there are many very bright highlights, with an overall low level of illumination over the rest of the picture. Under these conditions, the bright stars stand out clearly against the dark background.

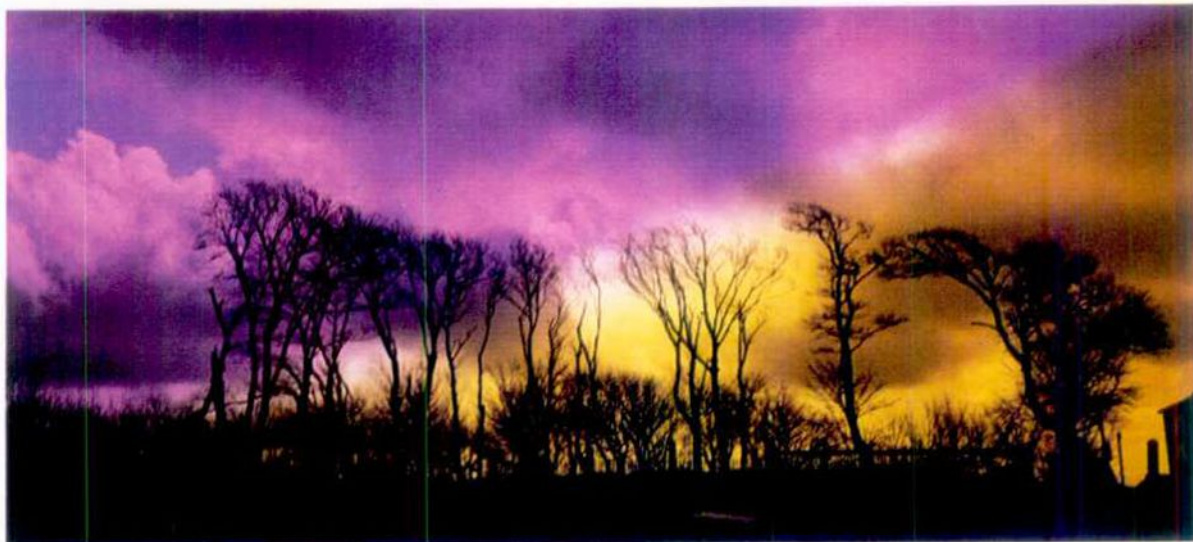
Flat lighting produces disappointing results with a starburst filter, so you should avoid evenly lit scenes. Even coloured neon advertising signs are not sufficiently bright to produce strong, clearly defined starburst patterns, and in studio pictures you should aim to use harsh lighting to give bright, powerful highlights. Spotlights or any other small sources of light are ideal for lighting a still life with starburst highlights.

Professional studio pictures, particularly of jewellery, require very precise, sparkling highlights, and pin sharp clarity over the rest of the picture. The way to achieve this is to make a double exposure on a large format studio camera. First the still life is photographed in the normal way, but without a starburst filter in place. The photographer then marks the focusing screen of the camera with a wax pencil at the points where the starburst highlights are to appear, and replaces the still life with a sheet of black card. Tiny holes are punched in the black card in the positions corresponding to the marks on the focusing screen, and the card is lit from behind. With a starburst filter in place, a second exposure is made on the same piece of film, and the starbursts appear exactly where the photographer wants them, without creating flare in the shadows.

If you have a camera with a removable pentaprism, there is no reason why you

Unlikely colour
Effects filters can produce quite unexpected colouring in a photograph. But you must take particular care to avoid hideous combinations

Starburst ship
The rotating mount fitted to starburst filters makes it possible to position the spikes where you want them



Judith Platt/John Topham Picture Library



Adam Woolfitt/Susan Griggs Agency

should not use this technique yourself, though the larger the camera format, the easier it is to achieve.

Diffraction filters

Diffraction filters are similar in some respects to starburst filters—they give their best results in similar conditions, where there are bright light sources or reflections, and a dark surrounding area. Instead of starbursts, however, diffraction filters produce a spear of coloured light, or a jagged halo in rainbow colours, on either side of a light source. Like starburst filters, diffraction filters are scribed with lines, but in this case, the lines are minutely thin and closely packed. They are so small that

they are invisible to the naked eye. The lines cause diffraction when light from the highlights of the picture strikes them, and they split the light into its component colours, in much the same way as a prism does.

Because diffraction filters produce coloured images, they are of little use on black and white film, where a starburst filter has a more pronounced effect. On colour film, though, the effect can be used creatively to put colour into a scene that has little inherent colour of its own—such as a snow scene at night, or the concrete jungle of the inner city.

Both starburst and diffraction filters can be rotated in their mounts so that the lines of light that they produce can be

moved in the frame to the position where they look most effective. Both types of filter should be checked at the working aperture before making the exposure, because, like graduated filters, the effects they produce sometimes look different when the lens is wide open. If your camera has a depth of field preview button you can do this, but if it has not, or if you are using a non-SLR camera, you will have to rely on trial and error to learn what the final result looks like.

Prismatic and multi-image filters

Faced with an unpromising subject you may be able to make some sort of interesting picture by using a multi-image attachment. This is a series of angular faces, cut or moulded on to a block of glass or plastic. Each face forms a separate image of the subject, so the final picture consists of three or more identical images ranged around a fourth. The central image is usually clearer than the others, which often have coloured fringes around them owing to refraction.

When used with a subject that has bold striking detail, surrounded by a dark or neutral surround, a multi-image prism can sometimes produce a rather pleasing result. A large variety of different prism patterns are made, but however ingenious they may seem in a catalogue, it is difficult to regard them as any more than a novelty. They can be used creatively once in a while, but the effect becomes tiresome if it is used too much.

Filter overkill

There are many other types of effects filters available. Some of them might be useful in circumstances where it would be otherwise impossible to produce an interesting picture, but many of them are of limited practical use.

Special effects filters are not a substitute for creativity and imagination, but some of them, particularly graduated filters, have a real value if they are used with discretion. Even the more exotic kinds are cheap enough to buy for amusement, and can very occasionally produce an interesting picture.



Creative approach

Children at school

As a subject, children at school offers plenty of scope for action shots, portrait studies and candids. But opportunities come and go quickly and much depends on your approach



Laurie Lewis

School can seem a closed world to adults, and few parents think of it as a natural place for photography. It does, however, take a major place in children's lives for many years, and is inevitably one of the strongest influences on the way they will think, feel and act. If you have a son or daughter yourself, and are interested in recording the incidents and changes of childhood, the school years are an essential element to be included. Even if your interest is less personal and you do not have children of your own, school can be a fascinating and varied location for photography—a separate society from your own that offers plenty of opportunities for candid photography.

In general, children are easy subjects, but when they are at school much depends on the situation. The school timetable dictates your opportunities, and the classroom, for example, needs a different approach from the playground. Inevitably, there will be restrictions on

Relay race *Using a telephoto lens and framing closely emphasizes the tension of the children waiting for their turn*

Group *Try shooting children when they are at their most relaxed, even if they are playing up to the camera*



Richard & Sally Greenhill



Classroom Once the children are used to your presence, keep your eyes open for spontaneous expressions

Tray Using a wide angle lens with care, you can extend the foreground and keep everything in focus

where and when you can take photographs, depending on the particular school and the attitude of the teaching staff. On a few days in the school year, such as sports or open day, there are no problems of permission—parents are welcome to photograph their children. At other times, it is advisable to approach the senior teacher, explain what you want to do, and ask for cooperation. Without permission, of course, you can go no further. If you are likely to meet resistance, offer in advance a set of your photographs to the school. Another argument that you can use in your favour is to propose a class project out of the photography—involving the children in planning and taking the pictures.

Another reason for having the school's cooperation is that it is vital to spend as long as possible with a single group of children, for it does take some time for them to lose their self-conscious awareness of the camera. Infants are generally more rewarding in this respect, although they may be less cooperative to start with. Quite quickly, they will become distracted, however, and will forget completely about the presence of the camera.

One of the simplest occasions to photograph is a regular sports fixture, such as a Saturday afternoon football game with another school. Here you have the opportunity for action photography, with plenty of movement and interest. A 35 mm SLR and a moderately long focus lens—around 150 mm or 200 mm—is ideal for most events like this. From the beginning of the game, try to find out where the areas of the greatest action

will be, and look for a position that will give you a good view of this important part of the field. Most school sports are played on fairly unsophisticated pitches, without stands and other high points that would give you an overall view, so you will probably have to photograph at ground level. Spectators behind the children playing can make a confusing background, but this can usually be kept out of focus and less distracting by using a long focus lens at full aperture.

Before the start, consider a shot of the whole team. A straightforward group portrait is not a difficult photographic assignment, and needs organization rather than artistry, yet will certainly give a lot of pleasure to all the children. If the game to follow is an important one, the attentions of a photographer will probably also give your child's team a valuable psychological advantage. Because a group portrait has a formal purpose, you must be in control of the situation for the few minutes it will take. Nothing spoils the success of such shots





as much as indecision and time wasting on the part of the photographer.

Keep the group compact rather than widely spread, as this will help fill the picture frame. You can do this by arranging the children in two or more rows for instance, with one standing, one kneeling and one sitting on the grass. Unfortunately, chairs are hardly ever available at school sports grounds. If there are a large number of children and many will have to stand, place the taller ones behind, and set up the rows so that

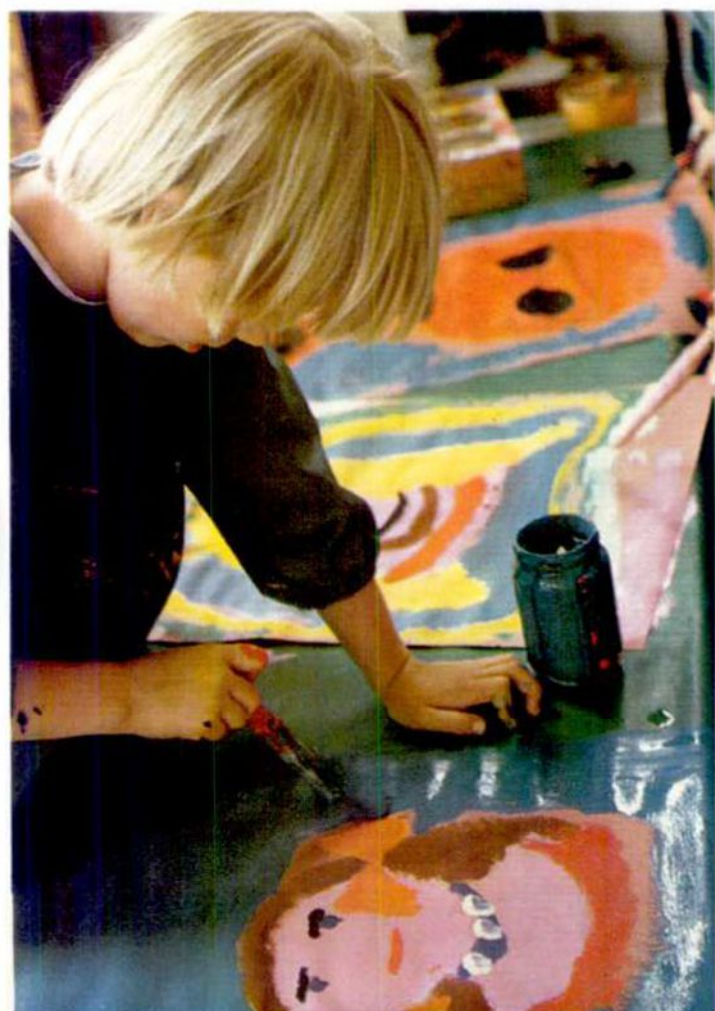
every face can be seen. In fact, the one important rule in group shots is to compose for the faces—keep the camera high for the same reason.

The more children there are in the shot, the greater the chance that one will blink, look away at something more interesting, grimace or in some other creative way spoil the shot. To cover yourself, take several shots in quick succession. Direct the children's attention to yourself and the camera by telling them when you are about to release the

shutter—in a formal portrait like this, it matters less that the occasional expression appears a little wooden than that the whole group is concentrating. Finally, always take a group shot before the game, not after. When it is over, the children will be tired and dirty, and one member at least will already have made a run for the changing rooms.

Because you are almost certain to be besieged for copies of the photograph, colour negative film is best—prints from colour transparencies are of poorer quality and are usually more expensive. This choice of film type applies to many other school photography situations.

The major occasions, such as sports day or school concerts, are more elaborate affairs, and generally offer several good opportunities for photography, particularly if they are outdoor events. As with most situations that involve children, however, you have to be able to work quickly. When taking informal shots, for example, the right moment for a picture may come and go



Chinese playtime
A high viewpoint lends playground shots more interest
Painting Photograph children when they are busy, and try to include some of their work **On the grass** A telephoto isolates these two against the grass

Anthea Sieveking/Vision International

Claude Genet/Sepia



in an instant, and even with posed, formal photographs you are likely to lose the attention of your subjects if you are uncertain of the exposure and have to fumble with the camera settings. This is the time when an automatic camera is really useful.

To be prepared for as many opportunities as possible, make a mental list of the types of shot you are likely to find. On a typical sports day, for example, subjects will not just include the events themselves. You can use the qualifying heats to look around and discover the best camera position. Try concentrating on approaches other than the obvious action shots—include close-ups of the participants, studies of the preparations behind the scenes, the reactions of the spectators, parents with children and finally the excitement of the prize giving.

Indoor occasions generally involve more technical problems, and may require the use of fast film, say ASA 400, or portable flash. School outings are other special events worth following, but the photographic possibilities will depend on the particular excursion.

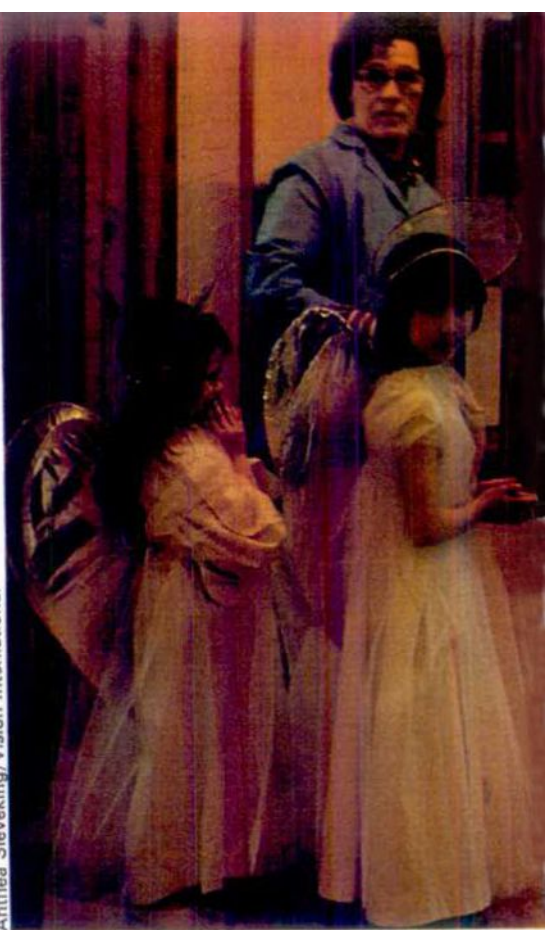
For the more regular, day-to-day

school activities, you will need to enlist the support of the teachers. This is especially true if you want natural and candid shots, for you will need to be around long enough for the novelty to wear off with the children. This might take the best part of a day, and then only if you try to keep yourself out of their attention. For informal pictures, the two locations are the playground and the classroom, the playground being, on the whole, the easier.

For candid photography, the playground is unrivalled. One approach is to stay at the edge and use a long focus lens. You will find that there are several children concentrating so hard on their activities that you will go unnoticed. Look out for close-ups of interesting expressions, full-figure shots of children absorbed in some activity, and groups playing games.

If, on the other hand, you are prepared to become involved yourself, move in closer with a standard 50 mm or wide-angle lens. You can expect the types of attitude, expression and activity to be different. In this case, let the children show you what interests them—it is a great opportunity for them to show off,

Anthea Sieveking/Vision International



Geg Germany

and you can take advantage of it.

By choosing the approach of involvement you have, in effect, entered the playground world, and so to some extent you will have to follow the tide of the children's interests. If a group of children set themselves up for an impromptu portrait, oblige them. Having taken the shot, however, you can expect to be besieged by other requests. Carry plenty of film and work quickly.

In the classroom, the atmosphere will be more formal and your presence is likely to be more disruptive, so the best approach is to have the teacher introduce you without delay. Explain what kind of photographs you want to take, and why, and then sit down quietly, out of the way, until the children have lost interest in you. For natural, unposed shots of the children at work, use available light rather than flash. This will require high-speed film and, if possible, a quiet camera.

Classes in practical subjects, such as art, woodwork and cooking will give you the most interesting opportunities. Infant schools often provide more varied activities such as singing and dancing, although older children concentrating on their work in a science laboratory, for example, can produce very good pictures. Scientific equipment can add visual interest and it is very effective to show just what the child is working on, thus telling a story with your pictures.

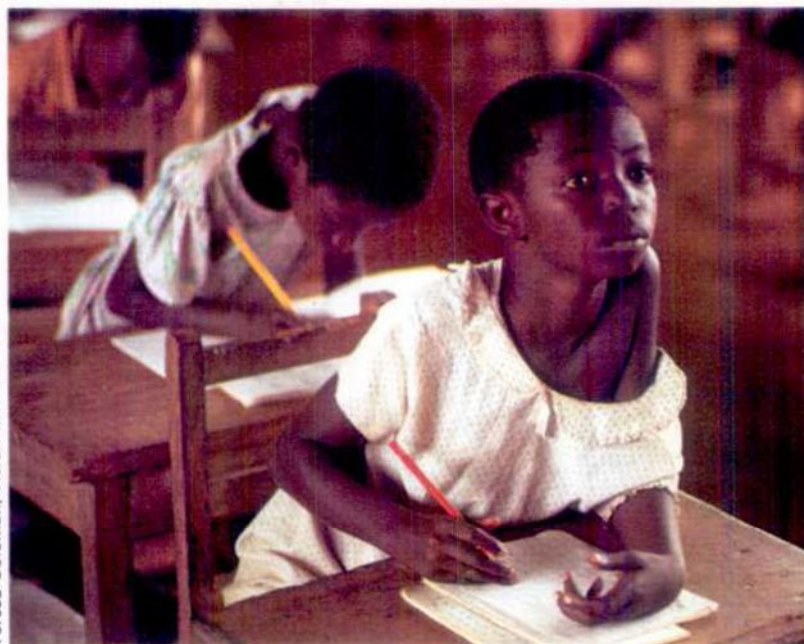
In the same way, it is often a good idea

Boys in grey A wide angle lens from a high angle makes the most of a small and cluttered classroom

School in the sun If you can work unobtrusively, you may get some very natural and candid group shots



Teresa Coleman/Vision International



African child You can take time to make a carefully composed picture while a child is concentrating hard

Angels School theatre productions are always good sources of material. Use fast film if the lighting is dim

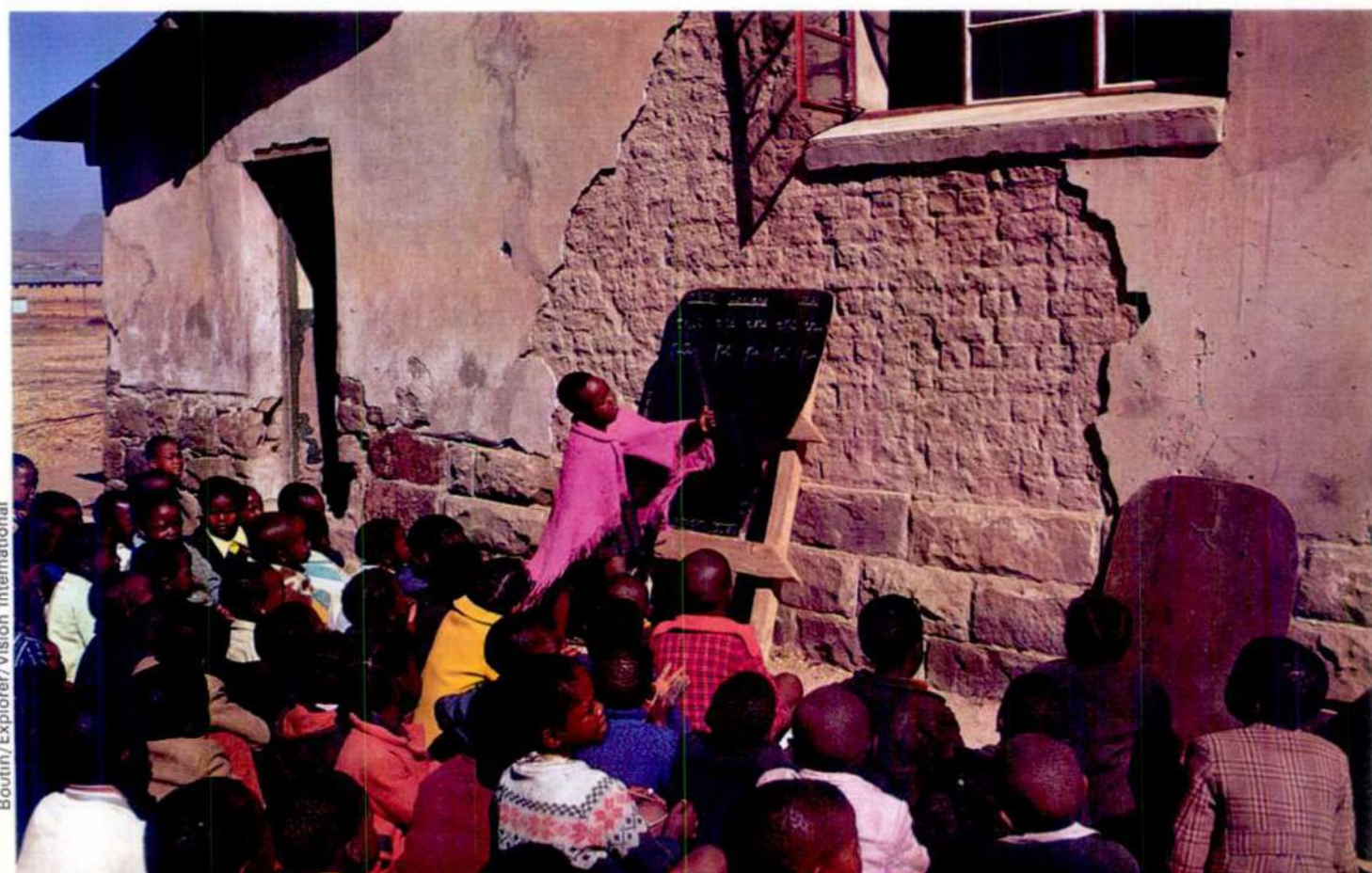
to include a blackboard in the shot. This establishes the context of the studying in progress—perhaps the blackboard will show mathematical problems or diagrams or a list of the characters in a play. The person looking at your photographs will immediately become more interested in the children and identify with them if he or she knows what they are studying. And do not forget the teacher. Activities probably make the best subjects for classroom pictures but

interactions between teacher and children can also produce good shots.

If you become involved with the school, you will almost certainly find yourself being enlisted to help, perhaps with the setting up of the school darkroom. To start with, children will just want to take pictures of each other pulling faces—but you can lead them from that to using photographs for school projects—perhaps taking portraits of members of staff or recording

places around the school. If you do try a little informal coaching of the school's keener young photographers, work with small numbers.

All aspects of school life offer good opportunities, and there is sufficient variety for you to expect more than just one or two good photographs from a single session. By planning to cover a number of different events and activities, you could have the makings of a rich and interesting photographic essay.



Boutin/Explorer/Vision International

Sight and the camera

Our view of the world is greatly influenced by colour. So it is useful to understand the way in which we see colour, and how this differs from the way photography records it

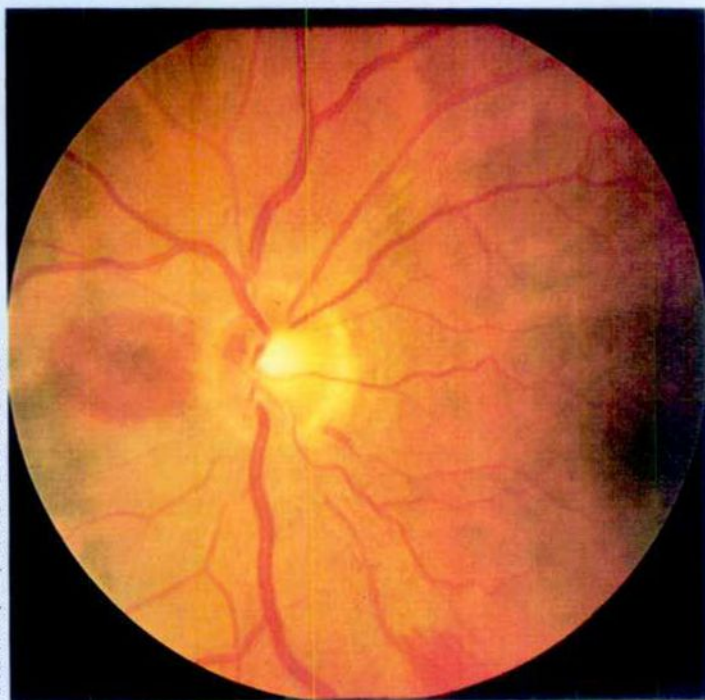
Colour is such a natural part of any scene that we tend to take it for granted. In normal light, the average person can perceive over 200 separate hues or colours. Surprisingly, this range is achieved by varying combinations of just three basic sensations. The same principle applies to colour film—but with differences. These differences account for many of the shortcomings of colour film compared with colour vision.

The principle of being able to produce any colour from a combination of the three primary colours (see page 550) is called *trichromatic theory*. The cone cells of the retina, which are responsible for colour vision (see page 822) are generally believed to be sensitive to each of the primary colours—some respond to blue light, some to red and some to green.

All other colours are represented by a mixture of signals from these cells. In a sense, the image on the retina is perceived in the form of a collection of blue,

Tungsten light and film

Normal daylight film suffers from a colour cast. Subtle colour differences are lost



A. R. Williams / London Scientific Fotos

green and red dots. However, these dots are so small, and our visual system constructed in such a way, as to overcome this breaking down of the image.

The spectral sensitivities of the cells overlap. The way in which they do this means that different colours are not perceived as being equally bright. For example, yellow-

green is the brightest spectral colour because it stimulates all three types of cell, whereas blue always seems dark as it only stimulates blue cells.

Ideally, the spectral sensitivity of a photographic emulsion would be identical to the general sensitivity of the eye. In fact, although a panchromatic emulsion is sensitive to all colours (see

The fovea The central part of the retina, responsible for sharp vision, consists of closely packed cone cells

page 534), its balance of sensitivity between the various hues is different from that of the eyes. A better tone rendering can be achieved with black and white films by using a yellow or yellow-green filter on the camera lens, to reduce the amount of blue light reaching the film.

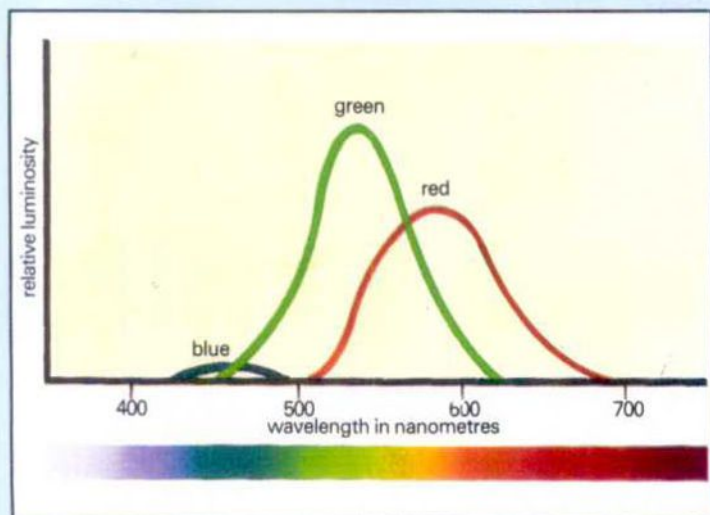
Another difference lies in the overlap between the sensitivity layers. The eye's red and green layers overlap to a great extent, for example, so a pure yellow colour triggers off equal responses in the red cells and the green cells. The brain interprets equal amounts of red and green as yellow.

In the case of film, however, there is less overlap. Many films are unable to reproduce pure yellow, unless it is very strong, as there is a noticeable sensitivity dip at that point. Most yellow colours, however, are not pure but cover

Tungsten light and the eye

Colour adaptation allows human vision to discern different hues





Sensitivities of the cells The spectral responses of the cone cells greatly overlap to give a range of sensations

a wide part of the spectrum, so there are few problems in practice.

Fluorescent lights photograph as green for similar reasons. They have an output with a strong green content, coinciding with most films' green sensitivity. In the case of the eye, however, the red layer is affected by their output as well as the green, because of the overlap of sensitivities. So the eye sees the lights as white or even pink, while the film sees them as green.

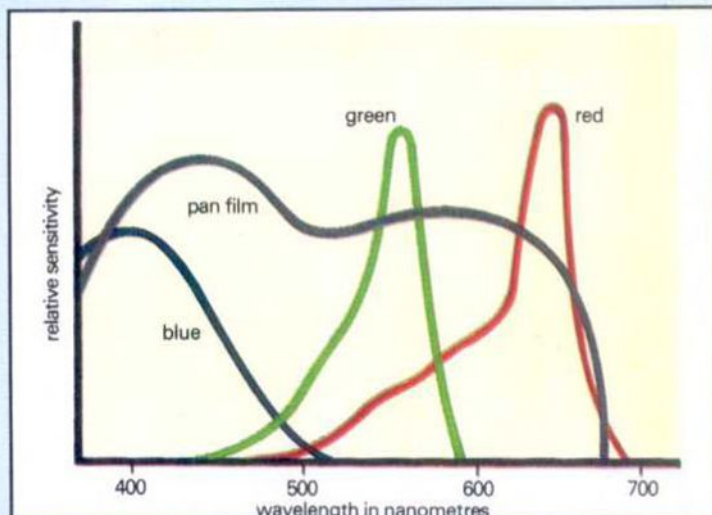
With colour films there are also important differences between vision and photographic processes. As the light level drops, human vision loses the ability to distinguish different colours. But a colour film retains this ability, though there may be some reciprocity effects (see page 466).

Human vision has the facility of *colour adaptation*. Sunlight, tungsten and flu-

orescent light, and a large number of other light sources, all look equally white when seen individually. Only when going from one to the other, from daylight into a tungsten lit room for example, will any difference be noticed (the light in the room will appear yellowish). Within a minute or so, however, the brain compensates for the colour shift.

Photographic emulsions do not have this facility to adapt. People are often surprised at just how yellow a scene in tungsten light looks when photographed, or how red a late afternoon picture appears.

Precise visual assessment of colour is made more difficult by the fact that response to colour is different from person to person. About a tenth of all males have truly defective colour vision, though only half a per cent of females suffer from this. Everyone has a slight colour bias, and this can cause



Film sensitivities The layers of colour film respond differently, with more prominent peaks and less overlap

problems when deciding on the correct filtration when colour printing. It is useful, if you intend doing any amount of critical colour work, such as printing, to have your eyes tested for colour vision.

Assessment of colour is also affected by the subject's surroundings. *Simultaneous colour contrast* is the effect which occurs when two different colour areas are put together. At the point where they meet, the difference in colour seems greater. This is due to temporary readjustments in the sensitivity of various cells. For example, anything which is placed near a bright green area will seem more magenta. This happens because the green cells have become fatigued, and so are less sensitive, while the other cells are unaffected. This is important when deciding on a surrounding for a picture, especially a colour print.

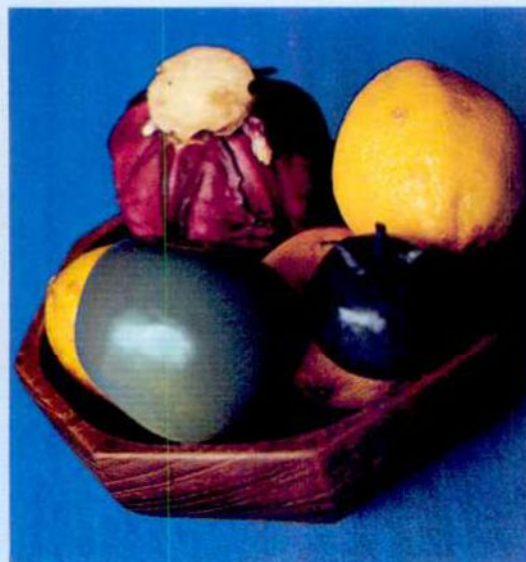
A similar thing happens

when you look from one object to another. This is best demonstrated by staring at a brightly coloured image and then quickly transferring your gaze to a plain white surface. You will briefly see an *after-image*, comprised of the complementary colours to the original image (see page 551).

These effects are of great importance when they occur in the photograph itself. However, when they are present in the subject, there is no guarantee that precisely the same effect will exist in a photograph of that subject. There is a limited range of dyes used in colour photographic materials, and so colours are not always reproduced exactly.

The differences in colour between a scene and a photograph of it are rarely noticed. It is unusual to be able to compare them directly, and allowances are automatically made for minor colour changes. Apart from a few subjects, such as skin tones and food, visual assessment of colour is seldom critical. The hues of a photograph are governed by mechanical and chemical processes. But human vision has the added complication of various psychological effects. It is difficult to say which system, human or photographic, is the more objective.

Simulated colour blindness Typical colour blindness, simulated in the picture on the right, results in an inability to differentiate between red and green. Normal vision is shown by the left hand picture





Darkroom

Colour from black and white film

There is no reason why your black and white negatives should only give black and white prints. Without any special technique, you can use them to produce striking coloured images



Whereas a black and white print tends to show shadows as black or nearly black, a coloured print from a black and white negative shows coloured shadows, giving a natural effect similar to the dark colours seen in reality.

Coloured prints can also be made from black and white negatives which have been prepared in the darkroom with *posterization* or line effects. Subtractive printing allows you to obtain subtle and unusual effects from these.

The printing process is the same as for normal colour, but as there is no colour in the negative, this must be provided by combinations of filters. This is initially done by trial and error, but with time a fine degree of control can be achieved. In addition, filters must be used to provide the orange colour for which colour paper is balanced.

After the enlarger has been set up as for normal printing, the first step is to find a filter combination which produces black or grey on colour paper from a black and white negative. Begin by using a filter combination such as 65 30 00 (otherwise written 65Y+30M), and produce a series of exposure steps at 5, 10, 20 and 40 seconds as for a normal test print, at, say, *f*/11. The resulting test print should range from solid black to white. If it is too light, or too dark, adjust the aperture accordingly. When the print is dry, view it carefully under natural light. If it shows a colour cast, you must adjust filter combinations to find neutral filtration.

You do this in exactly the same way as for normal colour printing. To reduce a colour cast, either add filtration in the same colour or reduce filtration in the complementary colour. Thus if the print is too red, add equal amounts of yellow and magenta filtration; if it is too blue, subtract yellow. Too much magenta can be corrected by adding magenta. This should be done in fairly small steps. For example, if a print is too red at 65 30 00, then 80 45 00 might produce a neutral tone.

If your range of filters is limited or you cannot achieve a neutral tone, a frame

Woodland sunset Subjects like this are ideal for printing on colour paper and the result is often more striking than that from a colour negative

John Ward



Hairstyle An unusual image can be made even more effective by the use of an appropriate colour

of unexposed but processed colour negative film, sandwiched with the black and white negative, should balance the enlarger light source with the dyes in the colour paper. Remember, however, to use this for all your tests and prints. It is

preferable to use filters instead, to avoid the loss of quality which may occur as a result of added graininess or dust specks sticking to the negative.

Making a test print

The next stage is to make a colour test print, showing six basic colours plus neutral grey. Refer to page 592 for suggested filtration for different colours.

Once you have established the filter combinations for the basic colours, you can combine these to produce virtually any tone you want, creating effects you would never see in a colour print.

Begin with the same exposure time that you found for a white tone on your neutral test print, but bear in mind that each filter combination carries a filter factor, so your exposure time must be adjusted accordingly. Thus, if your basic exposure time is 10 seconds, and filtration for blue carries a factor of 2, your time for the blue section of the test strip should be 20 seconds.

Before exposing the test print, you should make a mask to fit over the easel. Cover the print area with seven strips of black card, taped to the enlarger easel. Each strip should be left free at one end so that it can hinge up individually to expose a strip of the print.

You are now ready to expose your colour test print. Set the filter com-



Lake scene A colour cast can change a landscape completely, suggesting either evening light or early morning sun

Testing for density and colour

The first test print for neutral grey (right), was exposed for 5, 10, 20 and 40 seconds, with filtration at 65 30 00. Although it shows a sufficient range of densities, the tone is not a neutral grey, and the print is too warm. To make the test print below, filtration was adjusted to reduce the reddish-brown colour cast. Yellow and magenta filter values were increased by equal amounts to 80 45 00, while the paper was given the same exposure times. The resulting print shows neutral grey in a good range of densities. The colour test print (below right) shows the basic range of colours. From left to right: red, green, blue, neutral grey, cyan, magenta and yellow. Filtration and exposure were: red (20 10 00) 10 sec; green (60 45 00) 18 sec; blue (100 45 00) 18 sec; neutral grey (80 45 00) 15 sec; cyan (100 85 00) 20 sec; magenta (65 10 00) 12 sec; yellow (20 45 00) 12 sec. Filter factors were allowed for.





Glamour shot Another example of the way that choosing the right colour can add to the atmosphere of a shot. Here the tone not only lends the picture a pleasing 'period' quality, but it gives a suitable colour to the skin

bination for the first colour, lift one of the card strips, and make the exposure. Replace the strip, adjust the filtration for the next colour, and repeat for the next strip. Expose each strip in turn until the entire test print has been covered.

Unless you have dial-in filters, it is advisable to lay the filters out in order so that you can find them easily in the dark. Start by exposing the colour requiring least filtration (in this case red) and proceed to the colour requiring most filtration (cyan), adding filters as you go.

The results of this test will show you how the paper reacts to different filter combinations. However, they will only be valid for a given batch of paper, so make a new test for each new batch.

Printing your negative

Before making your first print, study the test chart carefully, noting the exposure times. With prolonged exposures some colours change—yellow, for instance, tends towards red. It is therefore essential to follow your test exposure

times exactly. In trying to achieve a particular effect, you should also bear in mind that the closer the filter setting is to neutral, the gentler and more subtle the colours will be. The further the setting is from neutral, the more saturated and brilliant the colours will be.

This allows you to exercise complete control over your final result, since you can give brilliant, unrealistic effects or soft, pastel tones. The colours you choose will depend on your subject as well as on your personal taste.

To make a single-colour print, simply set the enlarger to the colour filtration you want, using the colour test print information. Put the black and white negative in the carrier as usual, and when you have lined the image up on the easel, expose the print and process it in the normal way. The result will be a positive print with an overall colour cast, including coloured shadows.

For a multi-coloured print, decide which areas of the print require which colours, and make a note of the filtration

and exposure for each colour. Bear in mind that you will have to change the filtration in the dark, so any notes you make should be visible by the light of the enlarger alone. All colour printing must be done in total darkness.

During each exposure, a part of the print is 'coloured in', and the rest of the print must be covered for that exposure.

You can shade areas of the print with a shading tool, as explained on page 222, or you can make a jig (see page 362). As the jig is slightly raised above the paper level, it gives a slightly soft outline. Where a sharp edge is required, you can tape one or more masks, cut to the outline you want, to the easel. Slide the paper under them, and arrange them so that you can hinge them up as the successive exposures are made, without needing to switch on the light.

Where a colour is meant to merge or fade into another, use a shading tool, keeping it moving continuously to avoid sharp edges of colour.

Set your filter combination for the first colour you want to print, and set the exposure timer if you have one. After masking off all areas which are not to be coloured, make the first exposure. Switch the enlarger light off, and cover the easel with a sheet of thick black card to protect the paper from the light. Switch the enlarger on, change the filters and reset the timer for the second exposure and switch the enlarger off.

In the dark, you will now have to remove the black card and rearrange the masks or the jig as necessary.

This process can be repeated as many times as necessary to produce the colour combination you want.

Using reversal paper

There is no reason why you should not print in this way directly on to colour reversal paper. The process is in fact simpler than for normal paper, since all you have to do is project the colours of your choice on to the paper. In effect, you are painting with light.

Both Ektachrome R 14 and Cibachrome reversal papers can be used. When using a negative original, these will give a negative print, but the process is particularly effective when printing from positives made in the darkroom for various special effects.

When you have set up the enlarger as normal, dial in the filters that you would use for a typical transparency. The orange mask is now not needed. With the enlarger lens stopped down to $f/11$, expose a test print in steps at 5, 10, 20, 40, and 80 seconds. Process the print and, when it is dry, examine it by natural light for any colour cast.

To correct the colour cast with reversal paper, the procedure is the opposite of that for normal colour paper. To reduce a certain colour, you must reduce the filter value of that colour, not of its complementary, as in negative printing. Thus, if a print is too blue, you add yellow filtration; if it is too yellow, subtract yellow filtration, and so on.

Remember not to have filters of all three colours in the pack at the same time, or they will simply act as neutral density filters, reducing the overall light level. For example, if the filter combination is 30 00 15, adding 10 magenta would be the same as subtracting 10 from both yellow and cyan—30 10 15 is equivalent to 20 00 05.

When you have found the filter combination which gives you a neutral print, make a note of it. You can now make prints in any colour or colours by adding them to the basic filter combination. As before, remember to make allowance for filter factors each time you make an exposure.

Thereafter, the techniques for producing a multi-coloured print on reversal paper are exactly the same as those for normal colour printing paper.

Once you have completely mastered the fundamental techniques for producing coloured prints from black and white negatives, the limits on the range of effects you produce are only the limits of your imagination. On the one hand, you can emphasize the mood of a photograph, or even change it completely. On the other hand, by introducing unrealistic colours you can create striking and original effects. Subsequent articles discuss several ways in which this technique can be combined with lith film for colour posterization effects.

Abstract leaves Here the natural colour has been exaggerated, and given to the background. Filtration was 75 180 00, and exposure was 25 seconds

Garden trees With 30 15 00 filtration and a seven second exposure, this shot was turned into a sunset. The enlarger was moved slightly to blur the image





Buying a movie camera-2

If movies have certain advantages over still pictures, movies with sound seem to have still more. But there are many different movie sound cameras and systems to choose from

For many years, movies were silent and the only sound accompanying a film was the blast from the mighty Wurlitzer. Nowadays, however, the 'talkie' is so universal that a movie without sound seems a little odd. You can add sound to your home movies by simply playing a tape recording as you project the film, but this very basic method cannot give anything like the synchronization needed for speech and good sound effects. If you want sound on film, therefore, you must buy a movie camera that is designed for recording sound.

Early attempts at providing amateur movies with *lip sync*—that is, with the perfect synchronization of sound and picture essential when filming speech—

needed complicated and expensive equipment. With *pre-stripped* film, speech and music can be recorded in good synchronization and with surprisingly high quality reproduction.

A sound stripe is a narrow ribbon of magnetic tape or paste. It is applied to an otherwise unused part of the film, on the opposite side of the image to the perforations. Before the introduction of sound cameras for the amateur, stripe was added to the film after processing, for a sound track to be recorded later as the film was run on a projector with a built in recording head. This method is still used by some people, but most modern amateur movie cameras use a method which allows the synchronization

of sound and film at the time of shooting.

There are basically two methods of linking sound and picture: single system and double system. Double system is the method used by professional film makers and uses a separate tape recorder linked electronically to the camera. A regular pulse is generated, either by the camera or by a separate device. This pulse is recorded on a track of the tape reserved for this purpose. When editing or screening the film, each pulse

The extra dimension of sound *Live sound recording gives added realism to movies. It allows you to film subjects, such as people talking, that need sound to make sense*



Single system options *The microphone can be part of the camera—usually on a boom arm—or separate. The latter type avoids noise from the camera motor being recorded*

is related to specific frames of the film. The sound track, once edited, is often transferred to a stripe on the film.

The double system of sound recording can be very expensive. With Super 8 a special tape recorder, or a stereo recorder with a separate tone generator, is needed. These are used in conjunction with the PC socket which many cameras have. This socket is designed for use with flash in time lapse filming, and closes a contact once for each frame shot. If you wish to use double system recording, you will need a camera which has this feature. Double system sound gives better sound quality because the tape is wider and can run much faster. But it can also be very complicated, and sometimes needs two people to operate it, one on the camera and one on the tape machine.

Single system sound is much easier to use and most amateur sound cameras work on this principle. The sound is recorded, within the camera, directly on to film which has a sound stripe already attached. The recording head in the camera is placed so that the sound is recorded 18 frames in advance of the

Dave King/camera courtesy Sanyo & Eumig



Film choice *The range of films for Super 8 cameras is much more limited than for 35 mm. The top pictures show the results given by slow film (left) and fast film—Kodachrome and*

Ektachrome respectively. Below left is the result from Type G film. The colour balance is a compromise between daylight and tungsten. The last picture was shot on 35 mm





corresponding image. Because the sound runs 18 frames ahead of the picture, the film can be run at a constant speed over the recording head without interfering with the intermittent motion of the film at the exposure gate. Sound projectors use a similar system so that sound and picture remain in synchronization. Editing can be difficult, and this is dealt with in a subsequent article, but for most amateur purposes the single system is by far the most convenient.

When shooting with sound film, each sequence must usually be slightly longer than with silent film if the sound track is not to sound disjointed. When choosing a sound camera, therefore, it is a good idea to check whether it will accept the longer-running 61 m cartridges—indeed it was largely for this reason that these cartridges were brought onto the market. The long cartridges are also valuable if a faster running speed, such as 24 frames per second, is used to improve the sound quality—though filming in this way is very expensive. With most silent cameras it is not possible to use a sound film cartridge, which is worth remembering should you wish to film silently and add sound later.

Extra sound can usually be recorded on to sound film, using the *balance stripe*. The balance stripe is magnetic tape like the normal stripe but it is applied to the far opposite edge of the film to ensure that the film runs evenly through the camera. Although the normal stripe is very thin, if it was applied to one side of the film only, when the whole

Double system sound *Cameras with flash sockets can be linked to a tape recorder. Usually a tone generator is needed as well, though some cameras have these built in*

length is wound on to the spool, one side of the film would be higher than the other and the film would emerge from the cartridge twisted. This could cause problems with the feeding mechanisms of cameras and projectors, so the extra stripe is added. Recording on the balance stripe is usually done with a special projector, and is frequently employed for adding music to the live sound recorded by the camera.

Recording live sound involves using a microphone attached to the camera, and this is often mounted on top of a telescopic boom arm. This arrangement greatly simplifies operation, especially when shooting spontaneously. But the closeness of the microphone to the camera may result in noise from the camera being recorded as well. This problem can be reduced by using a *blimp* or a *barney*, which are covers designed to surround the camera and cut down noise.

Some cameras are noisier than others. When buying, always try running the camera without film to see how noisy it is. Blimps and barneys are not available for all models.

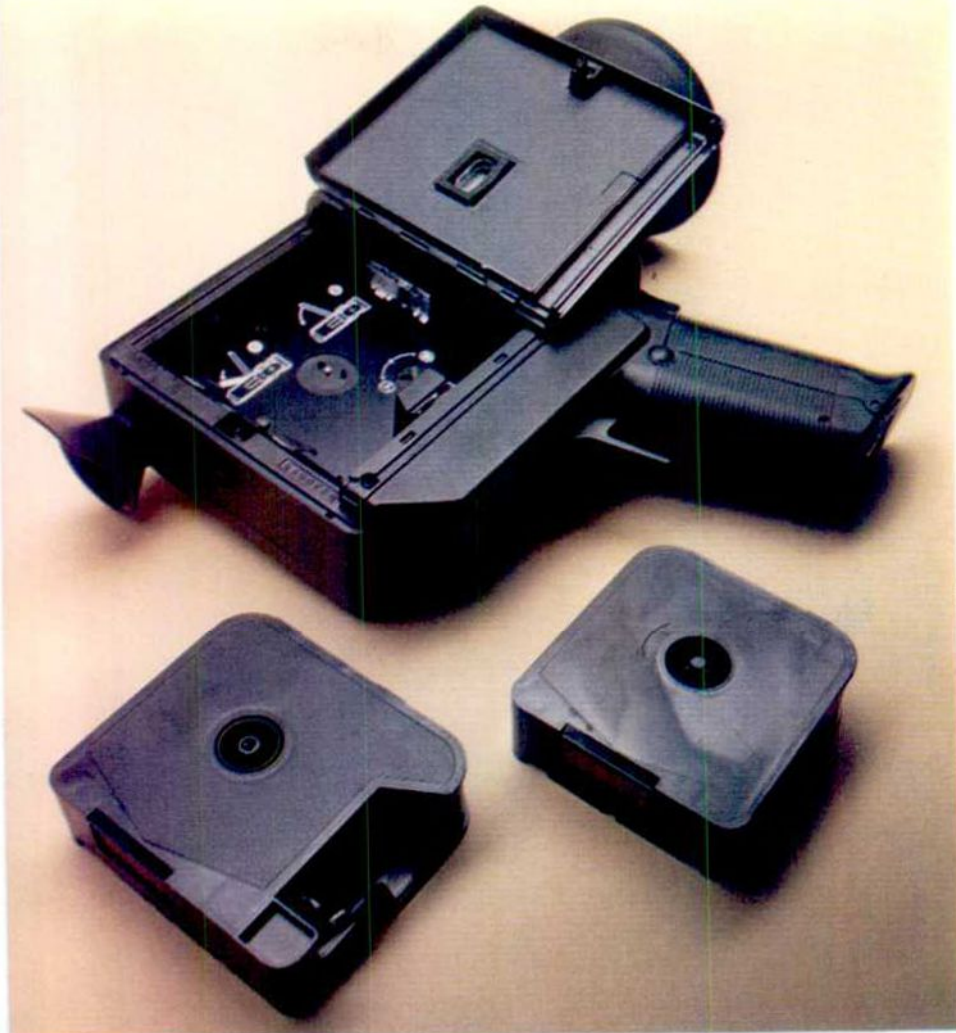
A better solution to the problem of camera noise is to use a separate microphone some distance from the camera. Most models, including those with boom arms, allow normal micro-

phones to be connected (the boom arms are usually detachable). This gives much greater versatility, as the microphone can be placed at the best point and the camera moved independently of it.

If possible, it is worth checking the sensitivity of the microphone which comes with the camera. Many of them will not pick up low sound. If, for example, you wish to do wildlife photography, it may be necessary to buy a more sensitive microphone. With the one supplied, you may just get general noise—or even silence—instead of bird-song.

However, boom microphones should not be too sensitive, or they are likely to pick up noise from the camera motor. So decide on the type of filming and recording you are likely to do, and choose a microphone to suit. Most models are perfectly adequate for general scenes, involving normal sound levels.

Most sound cameras now use *Automatic Gain Control* (AGC) and this facility makes sound recording much simpler. The AGC adjusts the level of the built-in amplifier to even out sound level variations, so the recorded track is neither too faint nor overloaded. As a check, correct sound level is normally signalled in the finder by an LED that flashes on peaks of sound. There can be problems with this method of recording, however, if there are moments when the noise level of the main subject is very low. The AGC device will raise the recording level so that irrelevant and unwanted background noise becomes



Film cartridges Like silent film for Super 8, sound film comes in cartridges that can be simply slotted into the camera. The sound cartridge (left), though, is considerably larger

suddenly very prominent. If this happens regularly, a disturbing *pumping* effect results. To avoid this, some cameras feature a control which limits the *gain* of the amplifier. This is used for speech at short distances, and effectively subdues the background noise. More sophisticated and expensive cameras incorporate a control for altering the record level manually. Though this method needs careful monitoring, it gives the cameraman much more control. If you intend to take your filming seriously, it may be worth spending a little more to buy a camera with this facility.

To allow the filming speed, as well as the AGC, time to settle down, some cameras do not record sound for the first second of each shot. If the film is screened without editing, these gaps can be irritating. Recent designs have reduced the sound gap to a fraction of a second, or even eliminated it altogether. With these designs there is often a slight hesitation after the trigger is pressed, before the film starts to run.

To obtain good quality sound, it is very useful to be able to listen to the sound being picked up by the microphone, before the start of a shot. Most cameras feature a monitoring device, with a socket for headphones or an earphone.

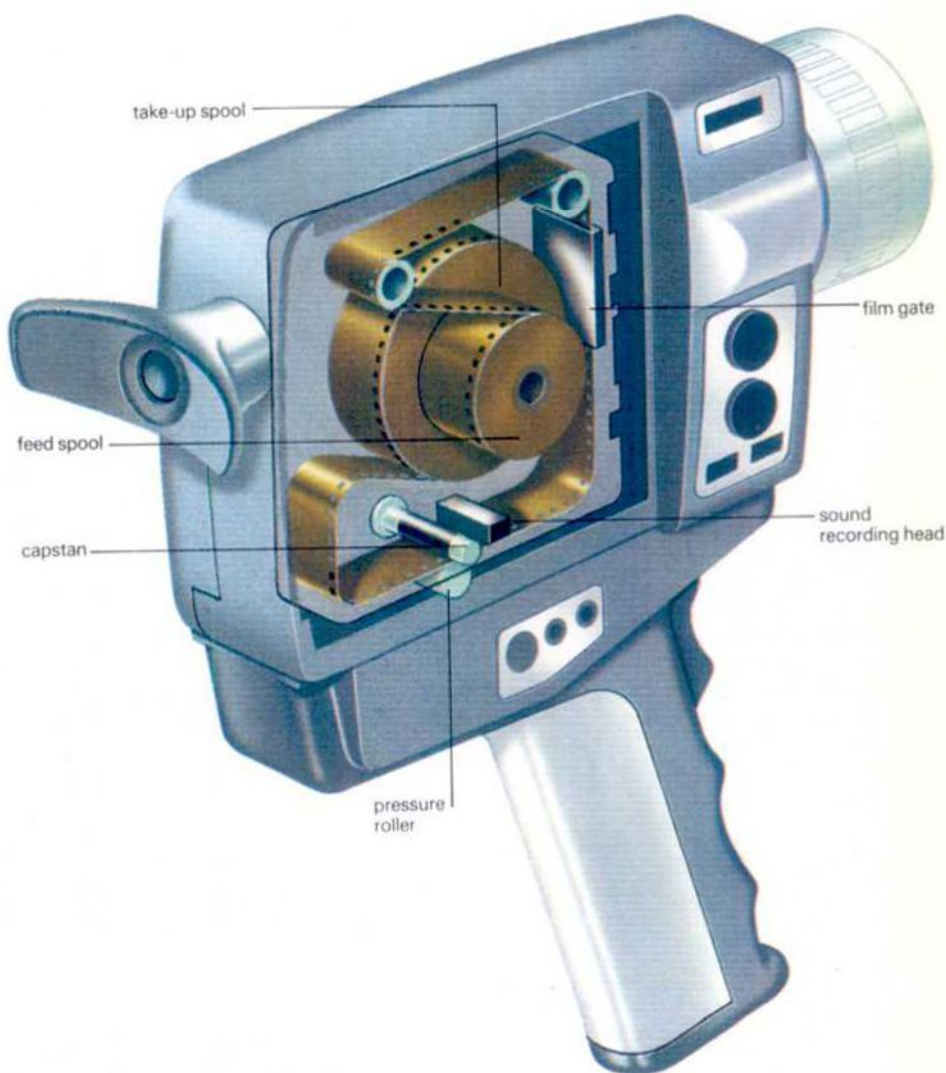
It is worth comparing the monitoring devices on several cameras. Sometimes the monitor sound is very faint, and does

not give a proper indication of what is, and is not, being picked up. It is particularly useful to be able to check for camera noise, especially when using a separate microphone, which may be more sensitive than the built-in type.

Other features which you may find on more expensive cameras include *fade* and *dissolve* effects. Fade mechanisms generally decrease the sound level to zero. Dissolves do the same but then rewind the film so that the next shot can be faded in. These functions are normally directly linked to similar features controlling the picture. Both are controlled automatically by the camera.

Filming with sound involves extra considerations and care, and often requires a different choice of subject. Look for a camera with a sound system that suits the type of filming you expect to do. If you usually film static or staged scenes requiring good sound, such as concerts, double system recording is best. But for general purpose work, single system is usually adequate, and because it is simpler to operate the movie maker is free to concentrate on the subject.

The film in camera The large opening in the sound cartridge is to allow the camera's recording head to contact the sound stripe. This head is some distance from the film gate



Dave King/Camera courtesy of Eumig

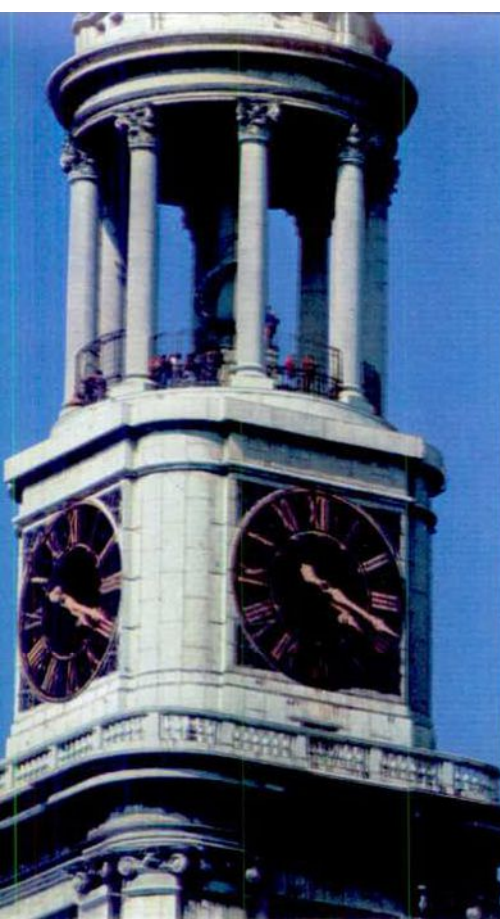


Assignment

HAMBURG

Despite its bulk, a long telephoto can be the ideal lens for use in the city, especially for cityscapes and candid shots of street life





Photographs by George Wright



Hamburg's mixture of pre-war and modern architecture, its bustling streets and quiet corners present an interesting challenge to any photographer. For this assignment we limited George Wright to a 300 mm lens. We hoped that it would force him to abandon panoramic views and concentrate instead on careful framing and on scouring the cityscape for interesting details.

The long telephoto lens is particularly suitable for photographing cities. It can be used to isolate subjects of interest from the general bustle of city life. It can also create fascinating juxtapositions of

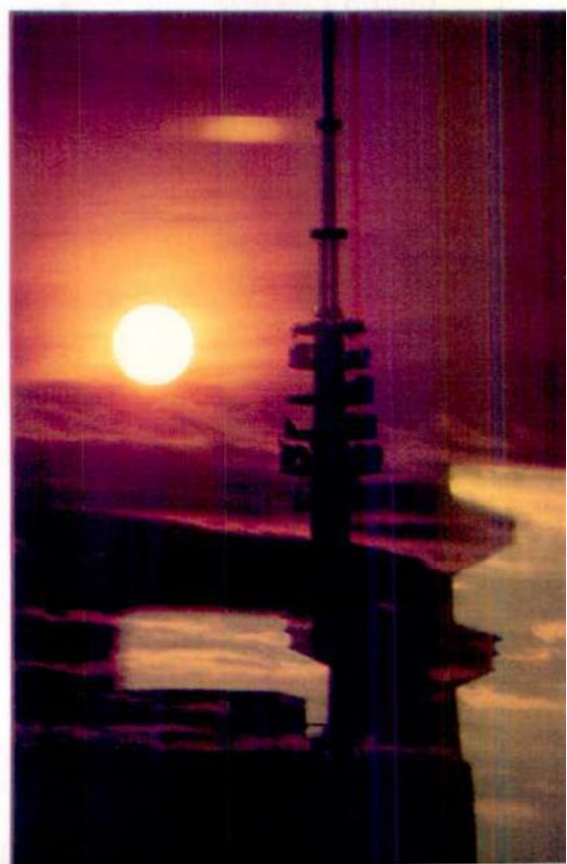
buildings and unusual features.

One of George's first problems was choosing the equipment to take on the assignment. The 300 mm Nikkor lens was quite bulky in itself. Since hand-held shooting was impossible at speeds of less than 1/125 second, a heavy tripod was also essential. George took a Nikon FM body, polarizing and 81A filters and several rolls of Kodachrome 64.

As an experiment, he included in his bag an Ohnar 300 mm mirror lens. On the face of it, this seemed an ideal piece of equipment, being much smaller and lighter than the Nikkor.

Street scene Despite the weather, George Wright has managed to include colour and movement in this picture. **St. Michael's church tower** was the high viewpoint that George chose for most of the scene-setting shots.

Trains in the rain The drizzle added atmosphere to this shot. **Seedy Hamburg** Avoiding overexposure, George has captured the essence of the Reeperbahn at dusk. **Lovers** The 300 mm lens provides the ideal opportunity to see without being seen. **Hamburg skyline** This beautiful shot was taken by catching the reflection in a shop window



A second problem for George was coping with the awful weather. It rained heavily for most of the day. However, he successfully turned these conditions to his advantage, producing some very atmospheric shots through the drizzle. His choice of slow speed film enabled him to make the most of the weak colours and low contrasts available. The moments when the sun did break through the cloud added variety to his photographs.

To reach a high viewpoint for his

details close by. Utilizing the shallow depth of field he could isolate people from the background by throwing it out of focus.

An example of this technique can be seen in the shot of the man sitting by the bicycles. This picture was taken through the mirror lens. Although it tended to reduce the sharp edge and contrast achieved with the Nikkor, George found that it could be used successfully, handheld, at 1/125 second. But one drawback



George Wright



Winding road By incorporating a strong diagonal into this shot, George has added interest to the picture and successfully broken the rectangle

action moving shots. Instead, the overall effect seems to suggest cars and motorists waiting patiently to leave the city.

By skilfully applying the positive aspects of the 300 mm lens to his advantage, George has achieved a wide range of different images—street scenes, shots of human and architectural interests and atmospheric cityscapes have been combined into a package of pictures which successfully captures the mood of the big city.

scene-setting shots, George climbed the 100 metre high St Michael's church tower. 'It was very windy up there,' he remarked, 'and the light was just beginning to clear after the rain. So I shot on f/8 at 1/125 second with a polarizing filter to bring out the blue in the sky.'

The shot of the Reeperbahn at dusk was part of a bracket exposure. George had to rely on his experience to get the timing right and to achieve the balance between the available daylight and the neon lighting.

The other evening shot, of the Hamburg skyline dominated by the TV tower, proved particularly troublesome. 'I tried many different angles, but eventually solved the problem when I saw the shot I wanted reflected in a shop window. I used the polarizing filter to control reflections. Shooting on f/8 limited depth of field and by focusing on infinity, I managed to exclude any interference from the glass surface.'

George was particularly pleased with the candid shots. They are, of course, one of the main attractions of using a long lens. The low angle of view on the 300 mm enabled George to pick out

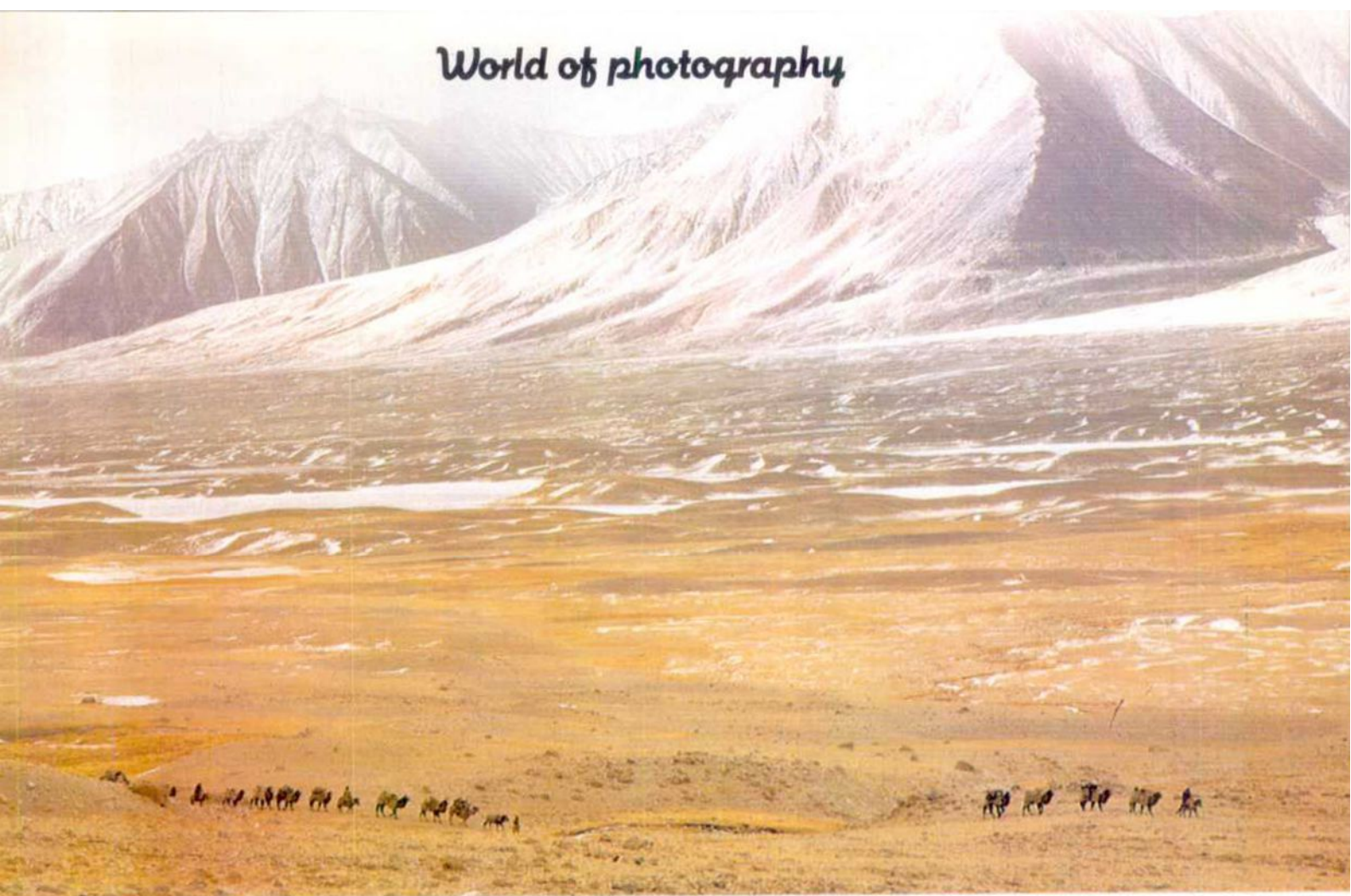
was that the lens was about a stop slower than its nominal f/5.6.

Through the shots of rush hour traffic, George hoped to convey a sense of Hamburg's great activity without actually making it obvious with fast-

Going home Commuters leave the city as the sun begins to sink, casting long shadows



Man and bicycles This image, taken using the mirror lens, lacks the contrast of those taken through the Nikkor



Roland and Sabrina Michaud

Seasoned travellers and photographers, Roland and Sabrina Michaud have spent many years in remote parts of the world recording ways of life that are virtually untouched by modern 'civilization'

Swept by the icy winds of winter, a vast shimmering desert stretches out into the distance before rolling up into the majestic snow-capped mountains of the Hindu Kush. At the foot of these mountains can be seen a line of tiny figures—men and animals seemingly engulfed by the awe-inspiring landscape that surrounds them. On closer examination the figures crystallize into the shapes of furl-clad men hunched up against the cold wind leading a string of laden camels and packhorses across the desert. It is one of the caravans of Tartary on one of their twice-yearly voyages south through Afghanistan—voyages that have changed little for hundreds of years.

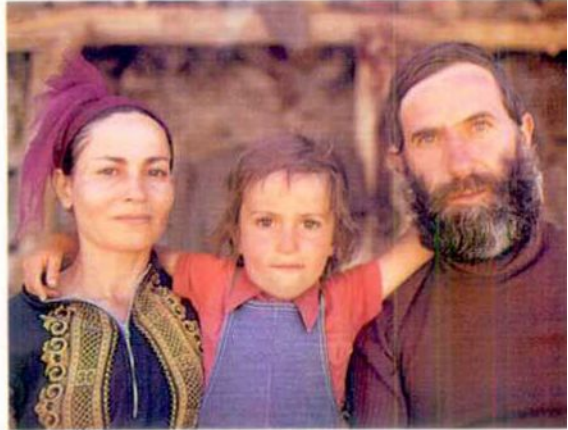
It is scenes such as these that Roland and Sabrina Michaud photograph so well. The Michauds spent four and a half years in Afghanistan, capturing the spirit and essence of the people who live in its remote places. The remarkable photographs that resulted from this visit form the major part of the *Caravans of*

Tartary, a book which gained the Michauds an international reputation.

The Michauds are travel photographers in the true sense of the word. They have spent most of the past 20 years on long explorations of different oriental cultures, witnessing ways of life virtually untouched by the vast changes which have occurred elsewhere.

Their aim in travelling has not just been to pursue an exciting way of earning a living photographing exotic people and scenes, but to thoroughly explore and portray to others something which they consider of prime importance—the natural harmony between man and his environment in remote places.

In order to do this they have often sacrificed the luxuries and sometimes even the necessities of life. Living in remote areas far from the comforts of so-called 'civilized' life, they have always involved themselves in the culture and everyday life of the people they are studying—learning their



Sabrina and Roland Michaud with their son. They find that people respond better to them as a family group

Caravan of Tartary (top) Camels loaded with goods on their long winter trek across 'the roof of the world' to trade with neighbouring tribes in the south

language and respecting their customs.

The principal outlet for their work is in books and magazines. Besides *Caravans of Tartary*, they have published a number of other beautiful books, notably *Afghanistan* and *The Mirror of the Orient*, as well as writing and illustrating innumerable magazine articles, including work for the prestigious magazines *Geo* and *National Geographic*.

In spite of this they rarely undertake commissioned work, preferring to submit ideas for their own projects, or already finished articles. This is because their journeys can last for anything from a few months to a few years. A concrete commission from a magazine, or a set deadline, might prevent them from adapting the length of their stays to circumstances or covering special events.

The vast body of work that they have collected over 20 years also earns them a continuing income. Their home in Paris is stacked full of carefully numbered and catalogued boxes of colour transparencies. Roland is insistent upon maintaining precise and detailed caption material for every photograph. During expeditions they number every film and keep notes of all their pictures. It is a discipline that has stood them in good stead. Pictures that were taken 20 years ago are still used in encyclopaedias, educational books and magazines, where exact information is crucial and often irreplaceable.

They also have agents in London and Paris who keep duplicates of their work, so that they are free to travel without neglecting this particular source of income. They hardly ever let the original transparencies out of their own care as they feel that the quality of printing and handling has decreased.

Things have changed since the Michauds first took up photography. The first 'photographic' trip was a 17 month journey through Africa in a tiny bat-



Bibi Djamal This young Kirghiz woman is mourning the death of her new born baby—killed by the cruel winter

tered Citroen 2CV—travelling the hard way. Although Roland enjoyed taking pictures, he hardly considered himself a professional photographer at this time. Nevertheless, it was this trip that marked their start as a photographic team. In a village they visited in Somalia, there was an area in which only women were allowed. Roland was therefore excluded and Sabrina learned to take photographs so that she could record this fascinating aspect of village life.

Fired with enthusiasm by this trip, they started working to earn money for their next journey as soon as they got back to Paris. They tried to save money in whatever way they could and this included selling illustrated articles about their

previous trip to magazines. The documentation of their trip even won them a prize from Citroen.

Eventually, they saved enough money to travel across Asia for a year and their savings in fact lasted them for all the four and a half years they spent travelling in the remoter parts of Afghanistan—a country that has become a major part of their lives. During this trip they were completely entranced by the beauty of the country and the life of its inhabitants, and they have since returned several times to record the way of life there. The results have appeared in some of their major works.

One of their most recent books, *Mirror of the Orient*, has taken 14 years to achieve. They talk passionately about this book. 'I think it is the kind of work that characterizes us best because at the final outcome perhaps we are not truly photographers. We are travellers in search of beauty, in search of truth'.

Every photograph in the book is juxtaposed with an early Islamic miniature painting, and the similarities are extraordinary. The Michauds have always loved these paintings and were struck by the similarities to everyday life in the east today. 'The same colours, the same attitudes, the same gestures as in the miniatures . . . it was a work that relied heavily on chance and circumstance, but it was always in my head.'

Sometimes Roland is criticized for not being entirely involved in the real life of the country, because his images only show the beautiful side of life. But after he, his wife and child had been totally absorbed in Afghan culture and learned the language and customs, he is sad that people think in this way.

'Sometimes I think that I don't have the choice or the potential to take other kinds of images, because my impetus has to come from inside. I forget photography or painting. What interests me is the continuity of a civilization. It's very important to me to realize that for over 500 years the people have dressed in the same way, have the same positions, the same thoughts and the same problems.'

Another recent book project was one that Roland undertook on his own—an exploration of life in South Korea. He was invited to stay there by his brother who was studying acupuncture. At first sight he thought that traditional culture had virtually disappeared. But as he travelled deeper into the country, he realized that it presented just as much of a challenge as Afghanistan. On his return to Europe he found that there were no photographic books on South Korea—it was untouched ground. So he returned to collect more material.

Characteristically, Roland immediately immersed himself in the art of the culture



Afghani traditional dress Three women of Mazar-i-Sharif wearing their chardi—an all-covering veil that protects them from the gaze of strangers. The exotic coats of the boys (right) are woven from silk dyed using age-old methods



—mostly Chinese and Korean painting—and it became one of his strongest influences. He reiterates Eastern attitudes by saying, 'If you want to paint bamboo you have to be with bamboo and paint bamboo for years. And then after 20 years you may be able to paint perfect bamboo. I try to be like that.'

While in Korea he travelled to remote villages and stayed in the various places he visited for as much time as he could. He also spent a week in a Buddhist

monastery sharing in the everyday life of the monks and gained their confidence by his genuine desire to understand their way of life.

The pictures selected for this book contained virtually no photographs of women—strong evidence of Sabrina's absence. When they travel together, she tends to concentrate on the life of women. Their teamwork is particularly useful in societies, such as in the Muslim world, where men and women fre-

quently move in fairly mutually-exclusive groups.

Although their photographic style is similar, they prefer not to work too closely together. While travelling, most of the photography is undertaken by Roland, but as soon as they are settled they start working separately—meeting only for meals and communal gatherings.

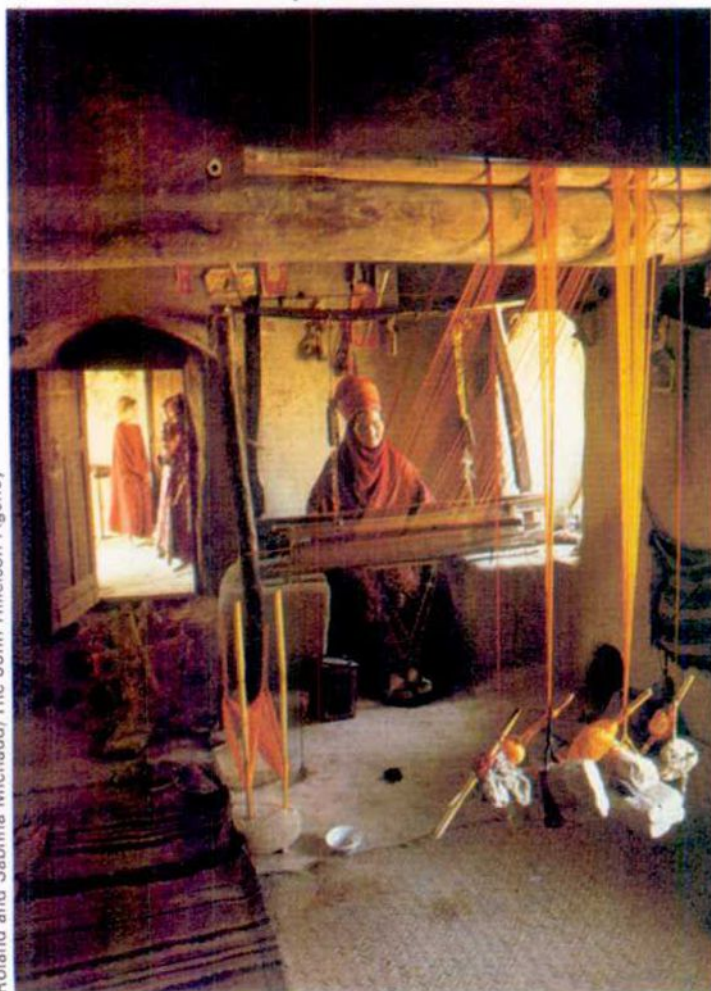
They try to travel as light as possible since they often have to walk many miles. They work with two Nikon camera bodies each and use interchangeable lenses. They keep their equipment separately—for safety and convenience. A habit justified when all Sabrina's equipment was stolen in Afghanistan.

Although they have a wide range of lenses, they prefer to stay within a range of 35 mm to 180 mm as they do not like their images to be distorted in any way. For the same reason they avoid flash or filters, and take their pictures by available light to capture scenes naturally.

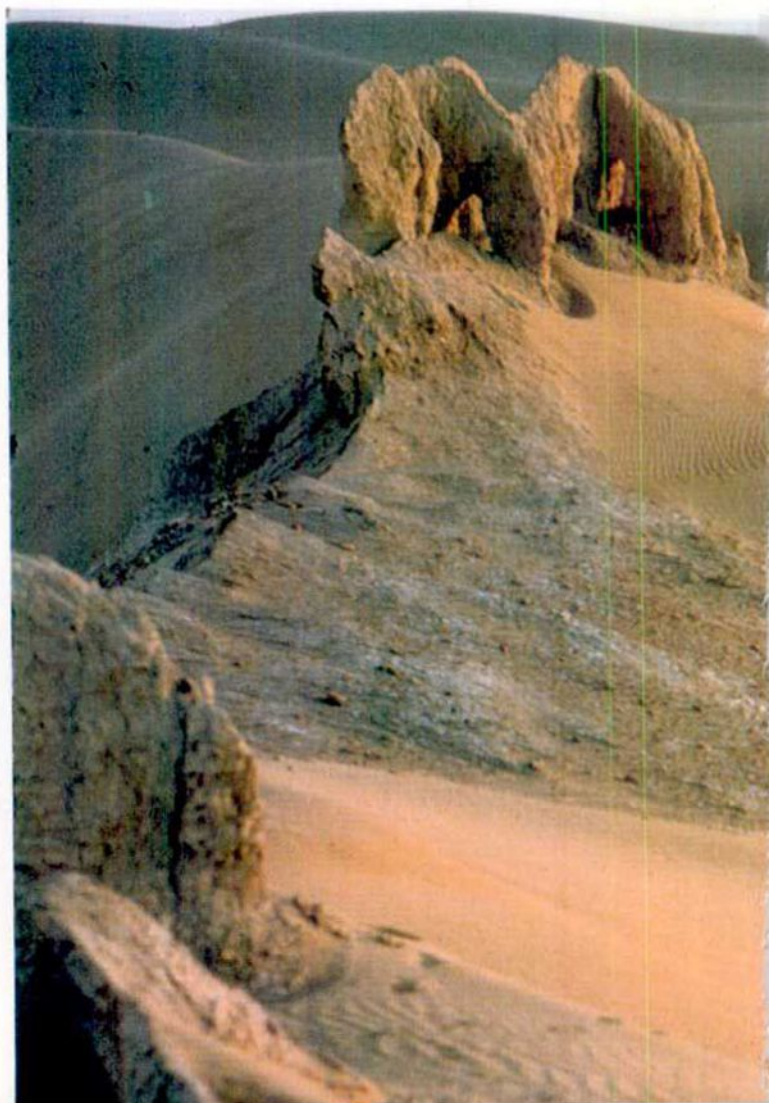
Lighting is extremely important to the quality of their pictures, and sometimes they will return again and again to a



Traditional ways of life For hundreds of years Afghani horsemen have engaged in the spectacular boz-kashi, competing fiercely for possession of a headless calf. The women too, still weave the traditional designs of past centuries. Such ways of life have changed little since Shar-i-Gholghola, its ruins now uncovered by the shifting sands of the Nimruz desert, was a great city



Roland and Sabrina Michaud/The John Hilleison Agency





Winter scenes An old Turkman relaxes with his grandchildren. Higher up in the range of mountains known as Band-i-Amir the temperatures are so low that vast waterfalls are completely frozen during the long, harsh winter months

place until the light is just right. In Afghanistan there is a famous valley of enormous, stone Buddhas carved into the rock-face. Roland wanted to photograph these, but they are virtually impossible to record well due to the lack of direct light—the detail of the carving is always obscured. He realised that he needed reflected light to show the detail, so one winter he went back to the valley when

he knew that there would be thick snow on the ground. And sure enough, the snow cast enough light onto the sculptures for him to get his pictures.

Their favourite time of day is the early morning and early evening, when the light is at its most subtle. They also find that this is the best time to capture the spirit of a country. 'In these traditional countries daily life starts very, very

early. I don't think you can understand India, for example, if at 4 or 5 o'clock in the morning you are not in the countryside to see the people.'

The Michauds like to travel as a family unit—they find that it provides a much deeper contact with people than travelling as a man or woman alone. People in traditional societies can identify with a family, and so accept them much more readily—something that most westerners find hard to achieve. It also gives them the appearance of simple tourists rather than photographers or journalists, so they avoid a lot of bureaucratic dogma and suspicion.

When the Michauds plan a trip, they become totally immersed in the research and organization months before they leave. They both read different books to save time, and exchange useful information, and they leave with a very carefully planned route and an exact idea of what they are going to do.

While en route they look after their equipment very thoroughly, knowing that it is irreplaceable. When they travelled across the Pamir Mountains of north Afghanistan during the winter, it was so cold that they had to sleep with their cameras in their sleeping-bags. Rather than holding onto exposed film for too long, they find people who are returning to Europe and give it to them, along with an address.

They are not worried about it not arriving—they use the same psychology in choosing who to trust with their film as they use in who they ask to photograph. They rarely get no for an answer as they are careful about who they ask.

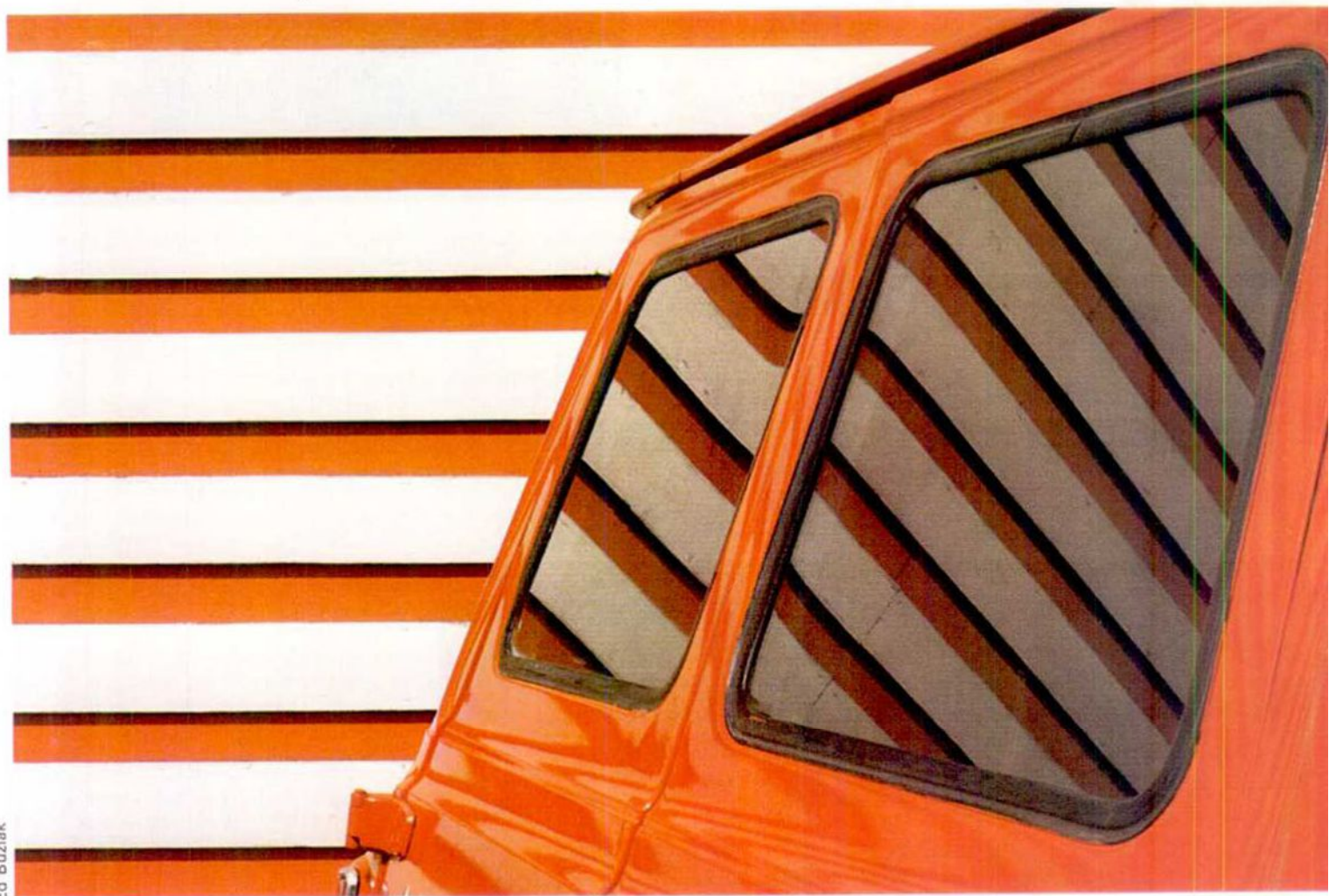
The Michauds are always happy to begin a new trip. They know what a privilege it is to be able to go away but know how quickly it will be over. 'If we do not come back full of colour, full of light, full of experience—then we have not benefited. We have wasted our time.'



Improve your technique

Making the most of compacts

With the right techniques, you can use an inexpensive compact camera to produce shots just as good as those from a costly SLR



Ed Buziak

Today's simple compact cameras, if used with care, can give results which are practically indistinguishable from those taken by an expensive single lens reflex. Indeed, in some circumstances they can be more suitable than an SLR, so the results will actually be better. Many of them have excellent lenses, and if you choose the right subject, they can produce results of professional standard.

Quite a few professional photographers carry small 35 mm cameras around in their spare time, and leave their heavy SLRs at the studio. The best way to make the most of a compact camera is to recognize its limitations and its advantages, and to use it in the most appropriate circumstances. Compared with an SLR, a compact's drawbacks are its fixed lens, its often limited control over exposure, its separate viewfinder sometimes with no indication of correct focus, and its lack of versatility. Its

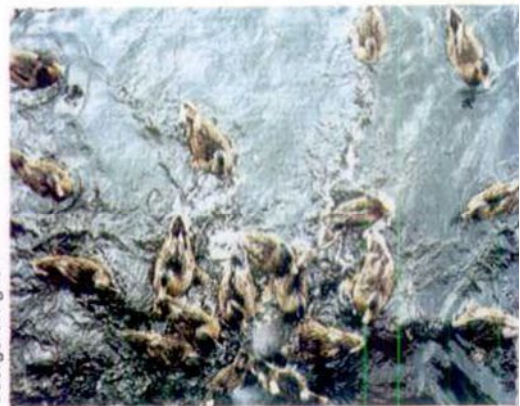
advantages are light weight, simplicity of use, and in some cases its less complicated lens. Some of these advantages can work against the unwary photographer, however, so it is important to recognize what the problems are.

Hold the camera steady

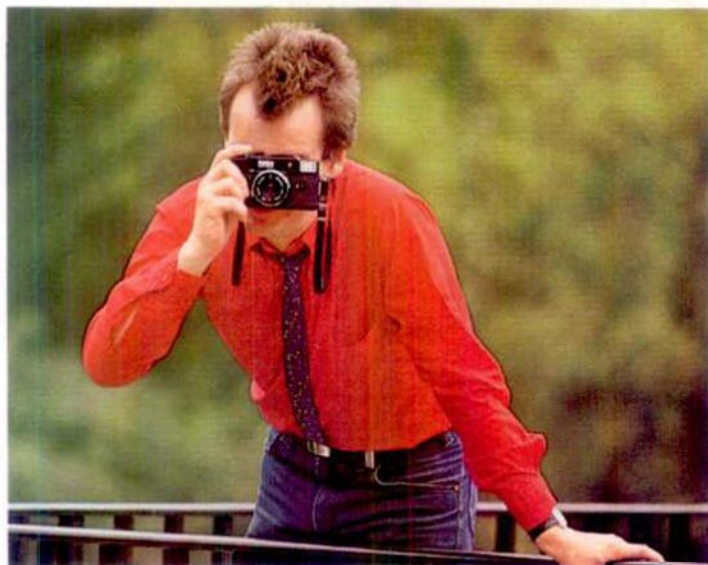
One of the most common causes of bad pictures from small, simple cameras is camera shake. Some small cameras weigh very little, particularly if there is extensive use of plastic in their construction. Every little movement of the hand is liable to jar the camera and blur the picture.

Camera movement can be overcome by using a sufficiently fast shutter speed, but on many compact cameras there is no indication of the shutter speed in use. On the popular Olympus Trip, for example, it can be either 1/200 sec or 1/40 sec (see page 383). Camera shake is

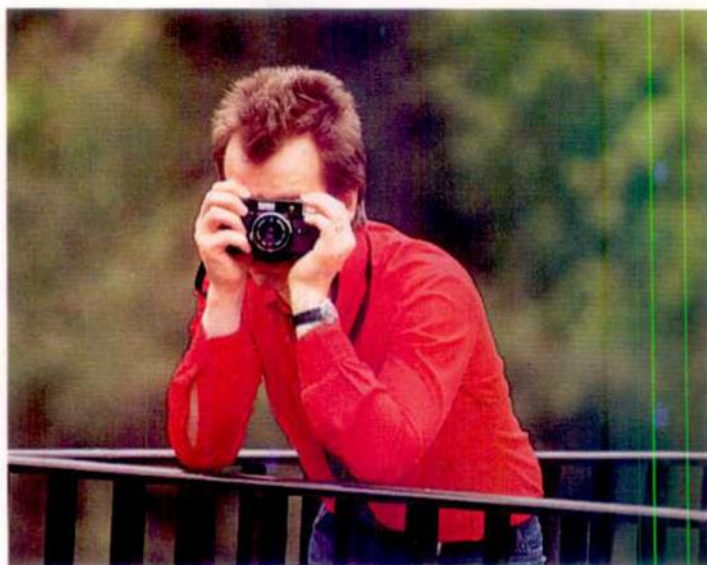
Red van Compact cameras give their best results when the subject is composed of large bold shapes and colourful patterns. Try to avoid images like that below, where the subject is scattered across the frame, or blends into the background



George Wright



Unsteady posture Camera shake ruins many pictures made by compact cameras, and a posture like this encourages it



George Wright

A firm grip By bracing yourself against a railing or wall, it is easier to grip the camera and eliminate vibration

quite likely at the slower speed so you should take extra care in holding the camera steady.

Whenever possible, therefore, brace yourself against a wall, or against a chair, or any other solid object. If you cannot do any of these things, take up a stable posture with your legs apart, and the camera pressed firmly against your face. More information on camera steadiness is given on pages 154 and 986.

If your camera has more than one shutter speed, try and use a speed faster than $1/30$ sec if you can, as speeds slower than this increase the risk of camera shake. Fortunately, compact cameras usually have lenses with quite a wide angle of view, and this in itself helps to

reduce the effect of camera movement. A few automatic cameras have a warning light in the viewfinder, which lights up when extra support is needed, and it is important to pay attention to this. Camera instructions frequently emphasize that a flash or a tripod is necessary when the light is on, but if you take great care to brace the camera solidly, you may be able to make use of available light without the need for a tripod.

Many automatic cameras leave the user to set the aperture, after which the camera decides on a shutter speed according to the *f*-stop chosen and the prevailing light. If you select a small aperture, these cameras will always set a slow shutter speed, so try and avoid

stopping the lens right down, which will increase the likelihood of camera shake. Using a fast film also helps, as the shutter speed will be faster for the same exposure at any given aperture.

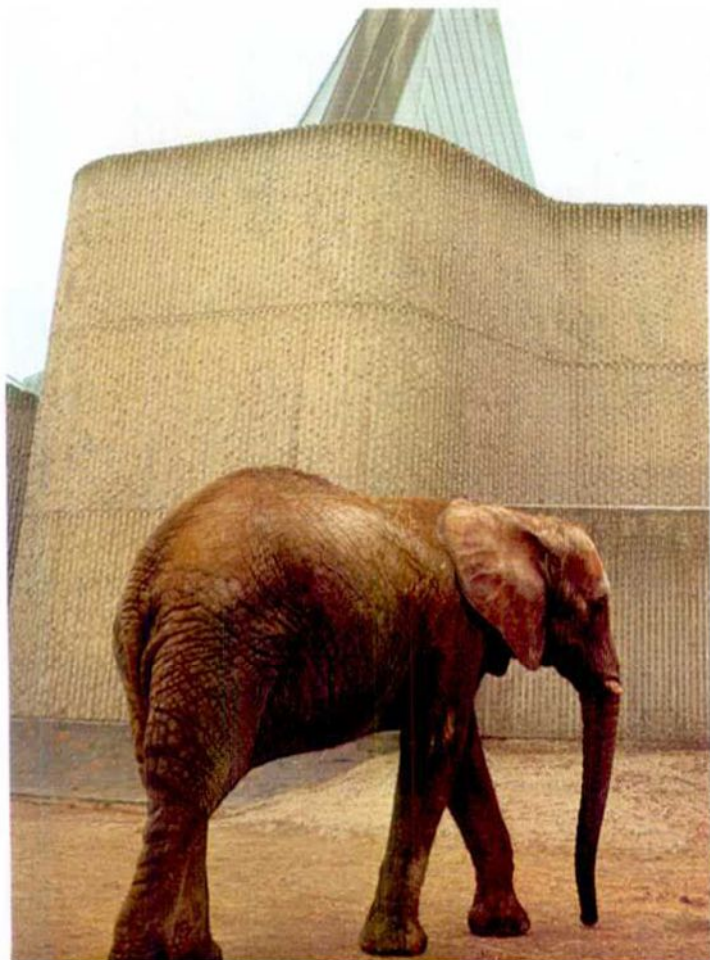
Keep your distance

A major disadvantage of compacts compared with SLRs lies in the focusing. The very simplest cameras have fixed focus, and give sharp results only if the subject of the picture is at a distance between about two metres and infinity. If you have a camera like this, it is important to keep within the limits set out in the instructions that come with it—unfortunately, it is simply not possible to get good results if you are any closer to the subject. The only exceptions are fixed focus cameras that have a variable aperture—either set by an auto exposure system or by the photographer, using the 'sunny' or 'cloudy' settings. In bright sunlight, the aperture will be smaller, with extra depth of field that may allow you to move in a little nearer. This extra leeway is usually only about a quarter of a metre, though.

Many compact cameras have a scale focusing system. The lens barrel either has distances in feet and metres marked

At the zoo

Small subjects usually make disappointing pictures with a compact. Stick to big animals that easily fill the frame and are not obscured by the bars of a cage





Carry a compact Make a habit of taking your camera wherever you go—that way, you will never miss a picture

on it, or has a series of pictogram symbols—a mountain to represent infinity, a group of two or three people to represent about four metres, and a head and shoulders to represent one metre, for example. If you find that your pictures are unsharp it may well be because you are either forgetting to focus, or not focusing sufficiently carefully. These are very simple mistakes to make, particularly if you are used to a reflex camera where an out of focus image clearly looks fuzzy on the focusing screen. Simple cameras usually have simple viewfinders, and do not have such direct indication of out of focus images, unless they include rangefinders.

If your camera has a scale focusing system, spend a little time practising your distance estimation with a tape measure. Guess the distance to nearby objects, then check your estimate with the tape. You should find that with a little practice, your accuracy soon improves.

In dim conditions where a wide aperture is necessary for exposure reasons, focusing is particularly crucial, because depth of field is reduced. When the

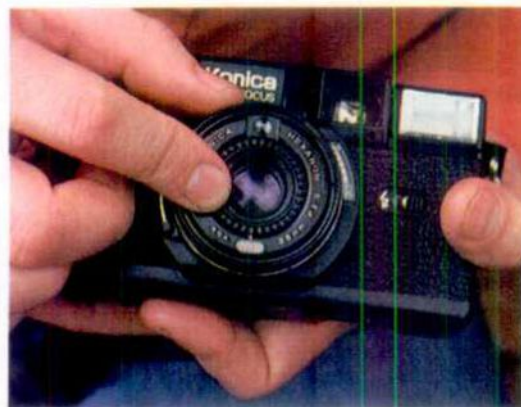
light is dim, automatic cameras usually set themselves to a wide aperture, so you should not assume that just because you cannot control the aperture, it is always fixed on some moderately small setting. In dull weather, and during twilight, take into account the reduced depth of field, and assume that only one part of the subject is going to be in focus—do not expect both a head and shoulders portrait and a distant background to be in focus.

In bright light, though, depth of field is much greater, because most automatic cameras set a smaller aperture. In these conditions, you can be much more casual about focusing, and it is often sufficient to leave the camera set to a distance of about three or four metres. Depth of field will ensure that everything is sharp up to about a metre away.

Use the viewfinder properly

Compact cameras use direct vision viewfinders that do not look through the lens in the way that an SLR viewfinder does. At short distances, this separation of taking and viewing lenses often leads to parallax error (see page 393). Almost all compact cameras have marks to show the exact area covered by the lens, and within this frame there is either a secondary line or small parallax correction marks, which indicate what the lens sees at short distances. Unless you pay attention to these markings, you may find that not all of your subject is included in the picture.

If the framing on your camera is wildly inaccurate, there may be a fault in the alignment of viewfinder and lens. To check this, set the camera on a tripod facing a brick wall. If it does not have a tripod socket, place it on a support such as a chair or ladder. With the aid of a friend, make clear chalk marks on the wall where the markings for corners of the frame appear in the viewfinder. When you have done this, photograph the wall without moving the camera. On processing the film, the chalk corner marks should be visible at the corners of the picture. If they are displaced by a small amount, you will be able to allow for this when taking pictures in future, but if the discrepancy is large, you should have the camera adjusted.



Changing ASA You can compensate for backlighting by changing the film speed—you do not need a special switch

Unusual lighting needs care

Compact automatic cameras are designed to work well with low contrast lighting, or when the sun is coming from behind the photographer. Crosslighting or backlighting needs special attention.

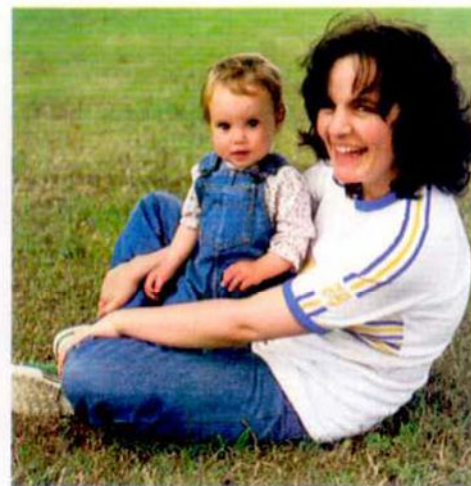
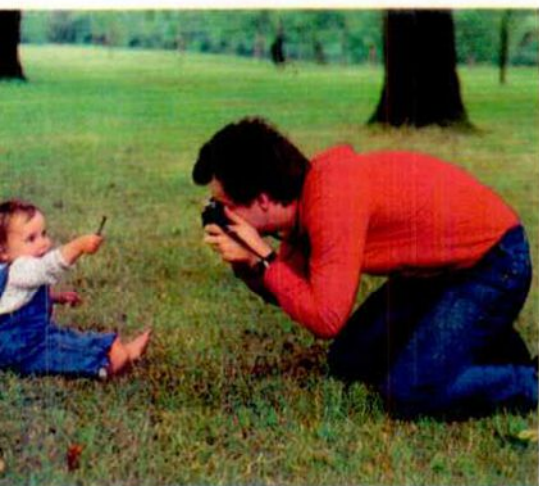
When the light is coming from behind the subject, it is quite likely that the camera will underexpose. This is a result of the design of the meter, which, instead of reading through the lens, generally takes a reading through a small window alongside the lens or viewfinder.

If you are taking pictures in back- or sidelit conditions, always give about one stop extra exposure, and then bracket the exposures on either side of this so that you have a greater chance of success. You can do this by setting the film speed on the camera to a speed which is lower than the film that you are using. If you have 100 ASA (ISO) film in the camera, for example, make exposures with the ASA dial on 100, 50 and 25.

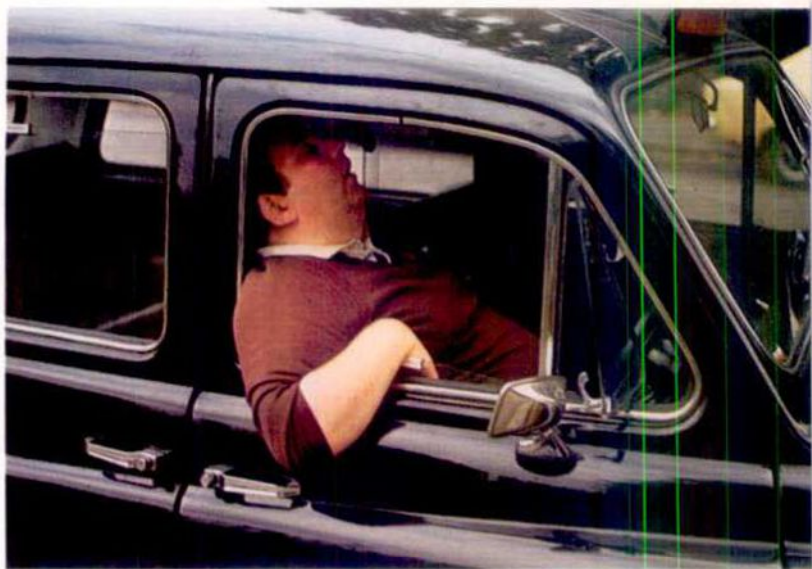
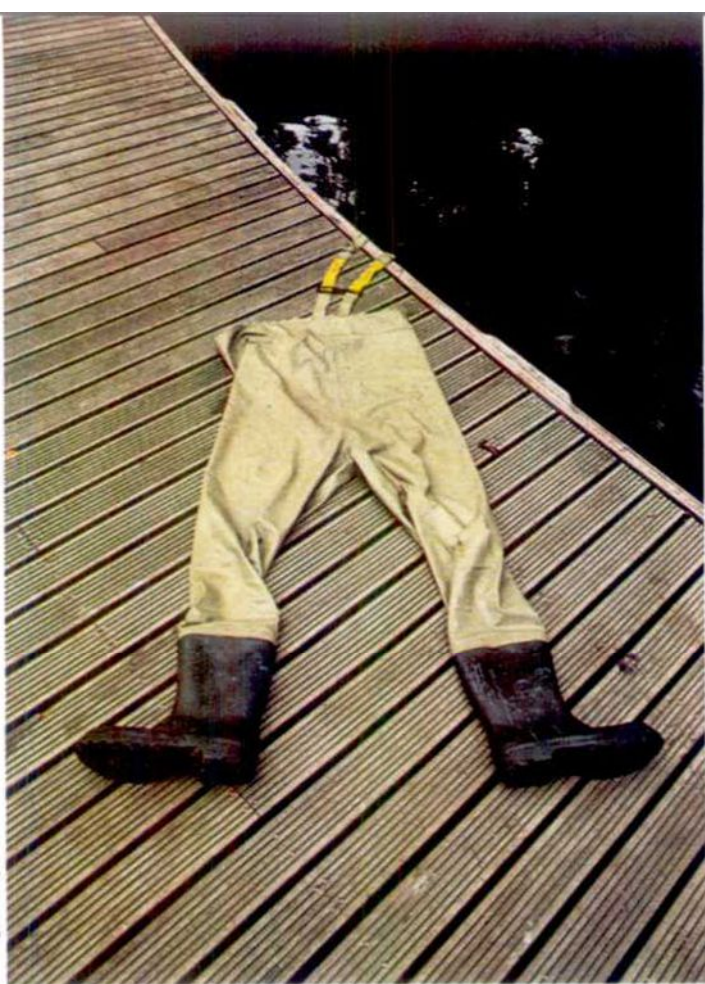
Better composition

When using a simple camera, particularly with print film that will give enprints, try and fill the frame with the

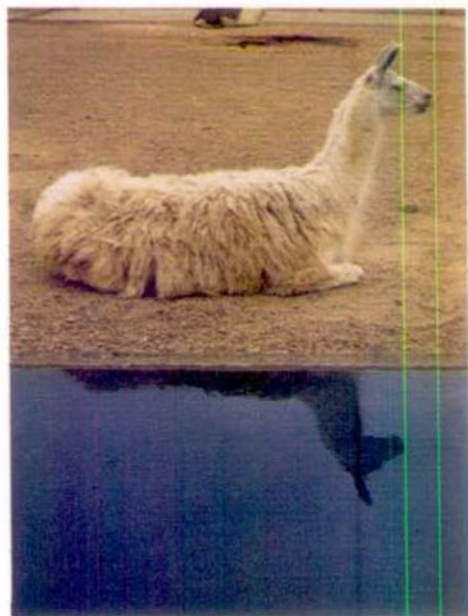
Keep your distance Compact cameras have a limited focusing range, and it is easy to get out of focus results when you are close to your subject. Instead of trying to fill the frame with the subject on its own, move back and add another element to the picture



George Wright



Simple subjects
Compact cameras give their best results when the subject is not too far away. Pick out uncomplicated scenes without many distracting details



subject—this avoids the common fault of a small area of interest in the middle of the frame, with rather boring surroundings. Move in towards the subject, and get as close as you can without cutting off important parts of the image at the edges of the frame. Unless you will be able to print the film yourself, so that you can make selective enlargements, do not bother taking a picture unless the subject appears fairly big in the finder.

When the subject is too small to fill the frame, even at the camera's closest focusing distance, try and add something to the picture in order to fill the frame. A picture of a small child on a bicycle looks much better than one of a small child standing in a wide expanse of grass.

Avoid photographing distant scenery. Unless the view is very dramatic, you will find it hard to make a good picture of a scenic view because fine distant detail that your eye picks out disappears when the pictures are printed. The only way to deal with such a subject is to include something in the foreground to provide a point of reference and a sense of scale. Alternatively, use a tree to frame the view and fill in some of the broad expanse of sky. It is often a good idea to choose an unusual viewpoint, particularly a low one, in order to make the most of the foreground.

Look out for bold, striking shapes and colours, and avoid subjects that include fine detail that is important for an understanding of the picture. Pictures taken on dull days can look very drab unless there is plenty of colour in them.

Avoid small subjects—if you take a compact camera with you to a zoo, for example, only photograph animals that

fill a reasonable proportion of the frame. Small birds and animals, however attractive they may look at the time, are invariably disappointing without a telephoto lens to compress distance.

In general, be on the look out for 'activity' pictures—a group of people playing football on the beach makes a far better picture than the same group of people sitting looking at the camera. Your camera should always be ready for action. Keep the film wound on and the controls set to the prevailing lighting conditions, with the lens focused on a point about four metres away. If an opportunity presents itself, all you need then do is to raise the camera to your eye and press the shutter.

A compact camera with its lens of about 40 mm focal length can be regarded in much the same way as an SLR with a lens of similar focal length. Many photographers favour such a lens, so the compact owner is at no disadvantage when photographing buildings, for example. The lens of a compact generally has fewer glass elements than that of an SLR, which can be an advantage when photographing against the light. In cases where the sun is included in the picture, for example, it can be impossible to avoid unwanted flare and ghost images with an SLR. A compact, however, can sometimes give better results under such circumstances.

Fast film gives more scope with a compact camera, and allows you to take

Check for parallax If the framing of your pictures is consistently wrong, you can use this simple method to check the accuracy of the viewfinder

correctly exposed pictures in much dimmer conditions without running the risk of camera shake. Although there is a small loss of quality compared with slower film, this is often unnoticeable.

Above all, remember to take the camera with you as often as possible. The beauty of a compact camera is that it is no great burden to carry around, and to leave it behind is to waste much of its potential. Make a habit of slipping it into your pocket when you leave the house. This way you need never miss a picture.



Understanding...

The camera computer

Electronics are playing an increasingly important role in modern cameras

Many modern cameras are claimed to be 'all electronic' or 'computer controlled'. Certainly, recent years have seen a marked trend away from purely mechanical cameras with only a little electronic assistance (such as the photocell of a metering system), to ones with full electronic control and a minimum of mechanical operations.

A significant factor is the progressive reduction in size and cost of the electronic components. This has allowed more and more electronics to be included.

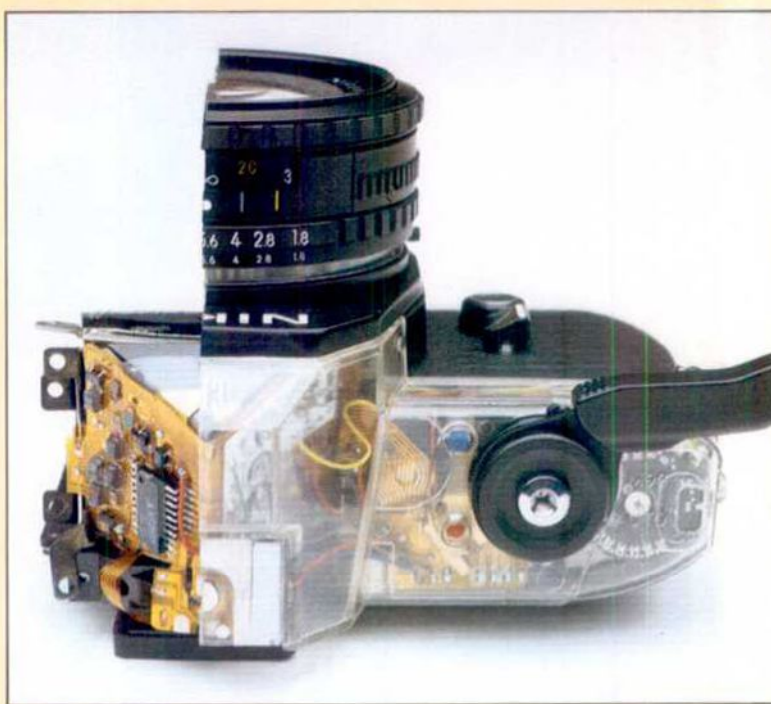
Unfortunately, there has also been a trend towards using computer jargon to describe electronic cameras. What is not often made clear is that the mechanisms of the equipment have been made increasingly complex in order to make their operation easier. Few photographers are interested in the exact way in which automatic exposure and other electronic functions are achieved, but

an acquaintance with the jargon can help to decipher the specifications given by the manufacturers.

Shutter control

The most common use of electronics is in the timing of the camera shutter, with the actual movement of the shutter blinds or leaves remaining mechanical (see page 85). Once, all leaf and focal plane shutters used mechanical timing arrangements of great complexity, with numerous moving parts. In electronic cameras, these have been replaced by a standard form of electronic timing circuit, consisting of a battery which charges a capacitor—a device for temporarily storing current—to a set level. When this level is achieved, a two-transistor electronic trigger actuates an electromagnet called a *solenoid*. When actuated, the solenoid closes the shutter.

The charging process is started the moment the shutter

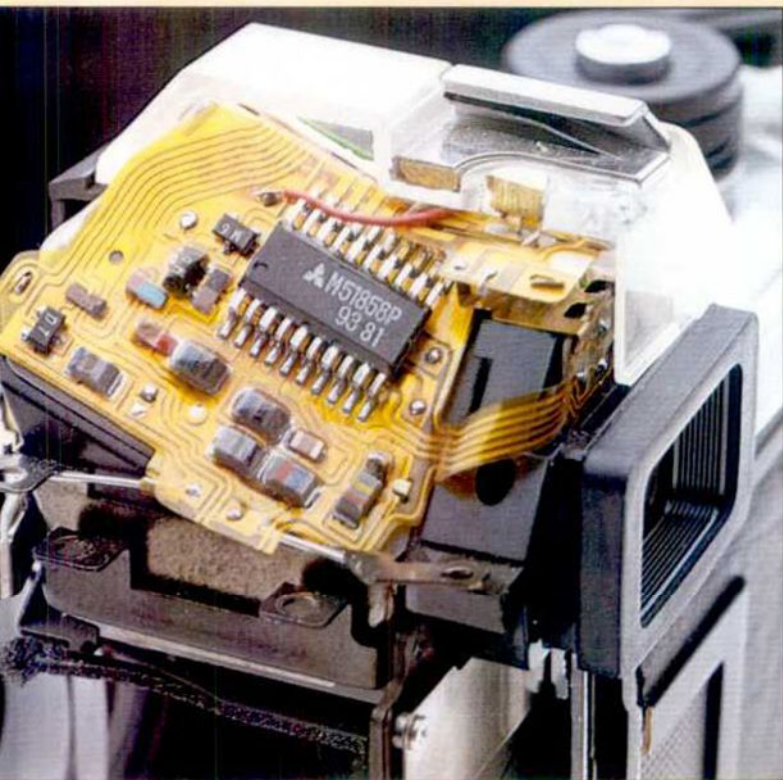


Mass of circuits Many mechanical functions have been replaced by electronics

Aperture control The curved electric contact registers the selected aperture



Photographs Dave King/camera courtesy of Nikon UK Ltd.



opens. This means that the time the capacitor takes to reach the correct charge level corresponds to the time the shutter is open—the shutter speed. The time it takes for the capacitor to charge up, and so the shutter speed, is altered by varying the resistance in the circuit.

Electronic cameras at first used a set of resistors of different values. In manual

operation of the shutter speed, moving the dial still simply selects the appropriate resistor. But it was soon realized that the cameras already contained a variable resistor—the photocell.

Automatic exposure

The resistance of the CdS cells which many cameras use (see page 699), varies according to the intensity of light falling on them. By using these cells in the control circuit, the shutter is automatically controlled by the metering system. In this way,

The microcomputer A large range of features is made possible by the small size of the electronic components

the shutter speed varies with the light level, giving *aperture priority* automation (see page 200). Using the photocell has the further advantage of giving a continuous rather than stepped range of shutter speeds, since the resistance of the cell is continuously variable.

The necessary control circuit for this kind of operation is very simple. The principle requirement is a pair of *potentiometers* which are devices for varying voltage. One represents film speed, and the other represents the chosen aperture.

This basic circuit has been added to considerably as cameras have become more sophisticated. A rearrangement of circuit elements allows shutter priority operation by precise control of the iris (using a solenoid). The CdS cell has, in many cases, been replaced by the *silicon photodiode* (SPD) which needs an additional amplifier to boost its weak signals to useful levels but works much more quickly. The fast acting SPD allows off-the-film metering for both ordinary and flash operations—which require extra control circuits.

More electronics

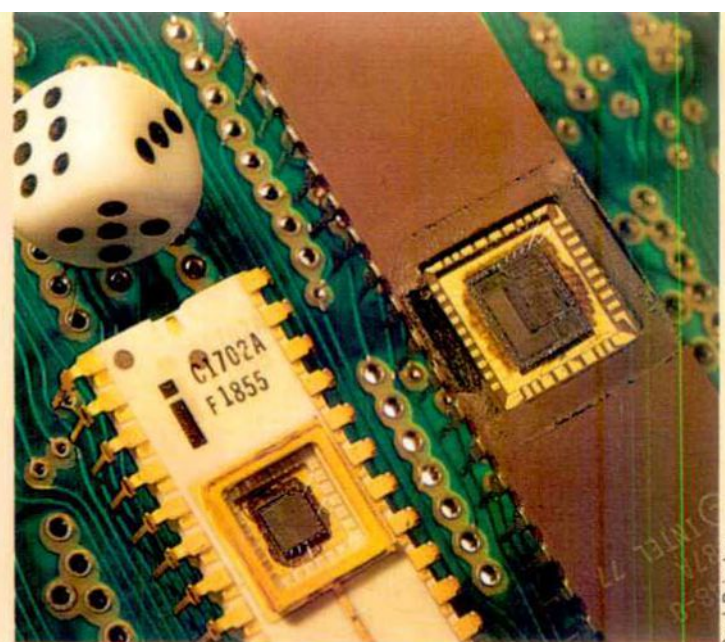
There are many other features for which electronic control circuits are used. The battery power may need a

voltage control, for instance, and, as with many of the circuits, this usually includes a microchip. Accurate timing for time exposures is often achieved by counting the pulses of a quartz crystal oscillator, but this calls for extra control and counting circuits. Programmed exposure (see page 203) is also electronically controlled. So is the operation of many motor drives, which must synchronize with the given shutter speed.

The traditional viewfinder display of needle and pointer has largely been replaced by Light Emitting Diodes (LEDs) and Liquid Crystal Displays (LCDs), or illuminated letters and numbers. All this needs additional control circuitry.

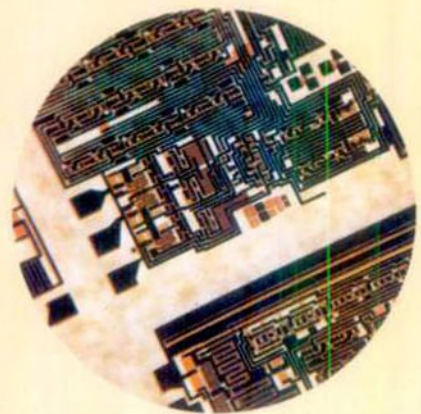
All this information would be useless if it was represented as levels of electrical resistance or voltage—*analogue data*—and must be translated to a more understandable form. In sophisticated cameras this is converted, by microchips, to *digital data*. Digital processing, which uses a microcomputer, employs a special coding method, and can cope with vast amounts of information. It requires a special preset program—a basic set of instructions—to work through, and a timing circuit to control the place of each step in the overall sequence.

If a large number of cir-



Paul Brierley

cuits is used in a camera, an extra control is needed to keep order. This task is carried out by a *Central Processing Unit* (CPU). This receives input information in digital form about the shutter speed, film speed, aperture settings and meter reading. Use of the motor drive, dedicated flash, self timer and stop down control all register directly with the CPU. After calculations, the output is converted from digital form into a form suitable for control of the shutter and iris. The information in the viewfinder is also supplied by the CPU. The full sequence, involving the several hundred calculations needed to synchronize all operations, takes only a fraction of a second.

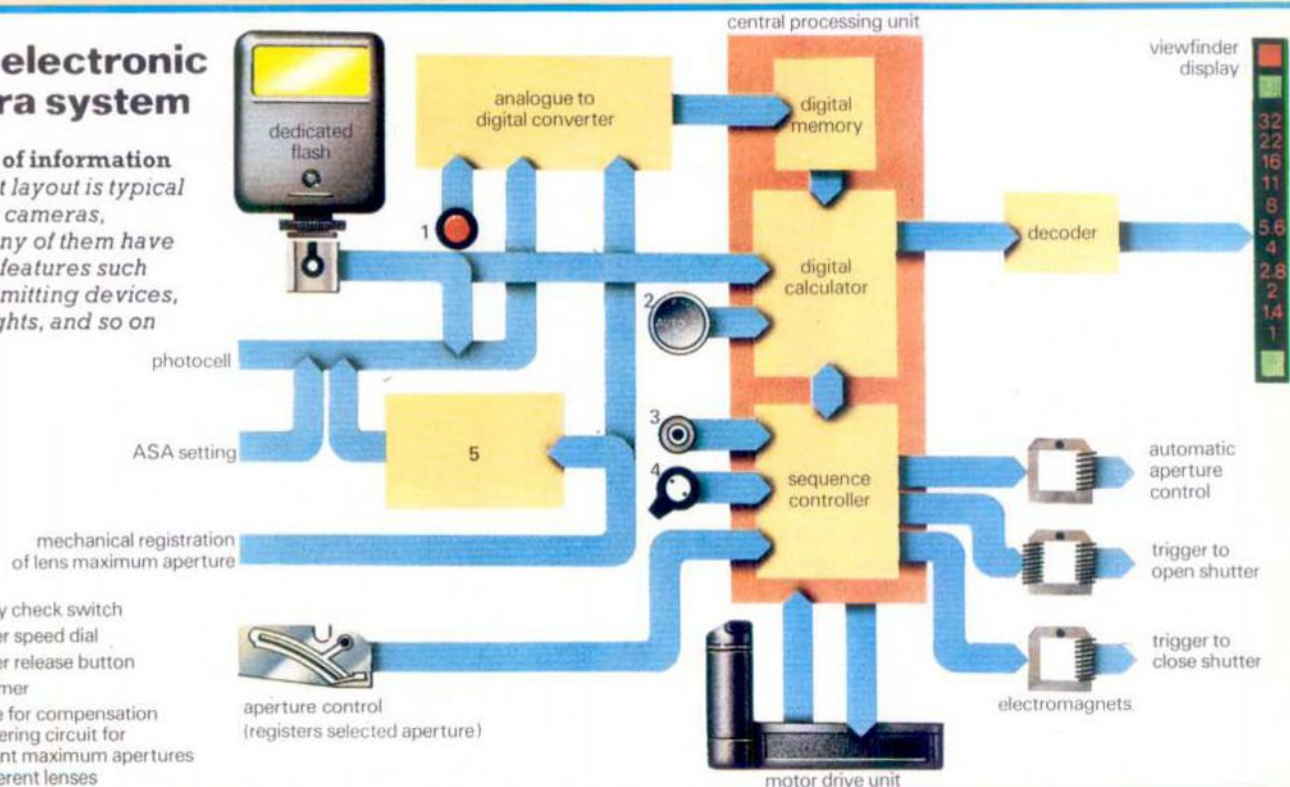


Silicon chips The top shot shows microprocessor memory systems using silicon chips. The leader line (lower) points to part of a chip the thickness of a human hair

Basic electronic camera system

Channels of information

This circuit layout is typical of modern cameras, though many of them have additional features such as sound emitting devices, flashing lights, and so on





Creative approach

Using shadows

Shadows are a vital element of many photographs, though their importance is often overlooked. With a little thought, you can use shadows creatively to improve many of your shots

Since photography is 'making pictures with light', it follows that the absence of light—that is, shadow—must be an important part of this process. Without shadow the world would seem a very much less substantial place, for it is shadows that give a sense of depth and form, and lend a three dimensional quality to the things we see around us. Photography, by its nature, is limited to a two dimensional plane, and therefore needs shadow to create an impression of the third dimension which it lacks.

Very often it takes a photograph to make us aware that shadows exist. This is because the eye tends to concentrate on the subjects of interest, such as a person's face, while ignoring light and shade. The eye can register a far greater range of light intensity than any film or paper can, so with normal exposure, shadows tend to appear darker in photographs than they do in real life. A photograph may show a prominent shadow that you did not notice when you pressed the shutter, so it is important when photographing to be aware of shadows and their effect on your subject matter.

Being acutely aware of light and shade—the way in which light strikes an object and the shadows it forms—is not a natural function of the eye. It has to be learned. In fact, far from being a help, our normal experience of seeing can actually hinder us when it comes to reading differences in light and shade. As you read this article, for instance, you are probably unaware of the play of light which, unless you are holding the magazine flat in perfectly even lighting, is almost certainly casting faint shadows across the surface of the page.

The first step in using shadows is to try to heighten your awareness of shadows until it becomes a habit. With experience you will notice interesting shadows that might form part of the composition itself, and you will also be able to avoid distracting shadows which may ruin a good photograph.

As you become more familiar with shadows, you will notice that the nature of the shadow is always defined by the nature of the light. Basically, there are two types of shadow-producing light—diffused and direct. Diffused lighting is the type created by an overcast sky when the light is scattered around, producing very soft shadows, or even no perceptible shadows at all. Lighting in these conditions is often described as flat, which implies that no pronounced shadows have been created, so that



Martin Proctor

Deckchair If a shadow is strong enough you can use it effectively as the main subject of your picture

subjects tend to lack the solid, bulky feeling which shadows would normally give them. (Photographers sometimes recreate these conditions in the studio, when for commercial or artistic reasons shadowless lighting is required.)

The opposite extreme—direct sun-

Cat As shadows begin to lengthen later in the day, look out for extraordinary effects

light or direct light from flash or tungsten lamp—produces hard, sharp edged shadows which contrast strongly with the illuminated area of the subject. In this case excellent modelling, or sense of form, is obtained. The old masters of painting knew the importance of using

shadows in this way. In the technique known as *chiaroscuro* they used highlights and shadows, usually from a single light source, to create an excitingly life-like sense of depth and form in their paintings. But unless the technique is used with great care, it can result in

Window A cleverly spotted shadow in bright sunshine, where the shadow of an open window overlaps a closed one



hollow eye sockets and ugly shadows of the nose. You may find that these shadows are too harsh for portraiture, unless you require a particularly dramatic or contrasty effect.

At first it may seem that shadows are more of a hindrance than a help in photography. In fact, as you become more aware of shadow you can begin to incorporate them into your composition. Far from appearing as awkward mis-

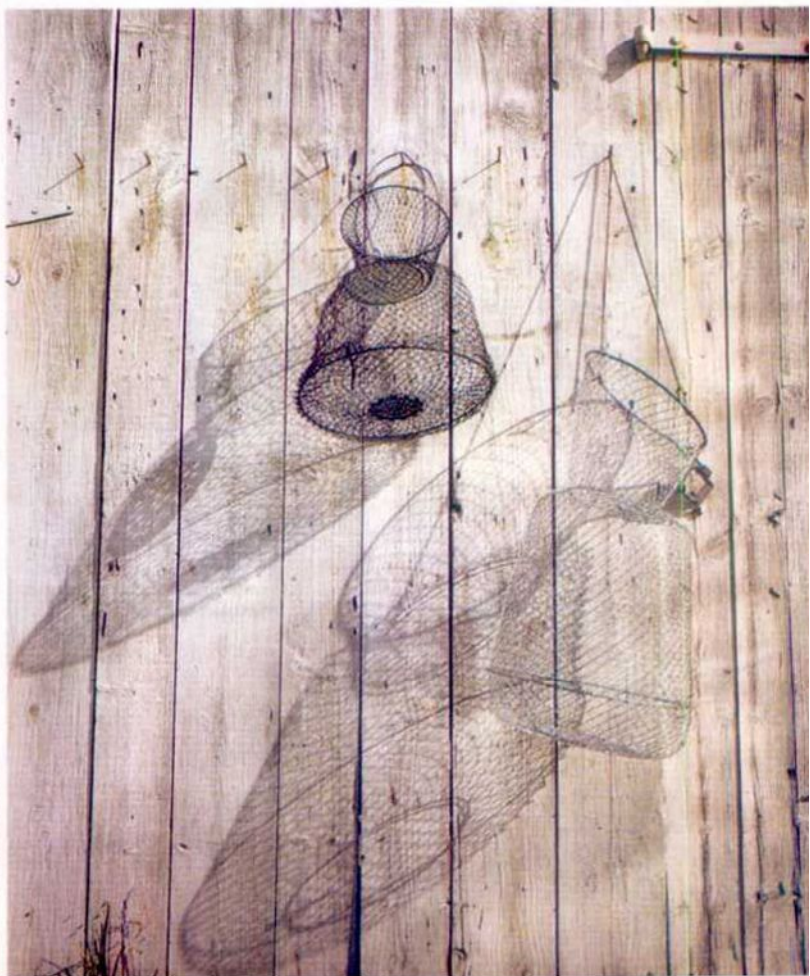
takes, you will find that they can sometimes command attention, and even become the main subject of your picture. One old rule in photography holds that you should never allow your own shadow to intrude in to the picture. True, it can look bad if it is obviously a mistake, but you could choose to include it for dramatic effect. For instance, you could position your shadow so that it looms threateningly over your subject. On the other hand, you could use it to indicate your presence at a scene where the only alternative would be a conventional shot on a tripod using the camera's self timer.

A fruitful approach is to try using other people's shadows as the subject in your pictures. Early morning and late afternoon shadows are longest, so if you want to try for exaggerated or distorted effects, these are the times to shoot. Look around for a high viewpoint—modern city centres often have upper level car parks or stairways which provide good vantage points. Clearly, the stronger the sun is at these times, the darker the shadows will be, and the more powerful their effects. Black shadows make the strongest and most positive shapes, since they lack any detail which may be distracting.

Try to choose simple images with clear, uncluttered shapes for your shadow subjects. These will be the most effective. Shadows like that of a boy with his dog, a woman pushing a pram or a tennis player reaching up to serve provide clear and interesting shapes for you to experiment with. Also look for shadows of inanimate objects with clearly defined shapes—a wineglass, a



Nets Delicate objects cast interesting shadows when the sun is at a low angle



Tractor Snow gives a clean, clear background for winter shadows like this

Tree The photographer has juxtaposed the real tree on the horizon with the shadow of another which stretches towards it. **Portrait** A

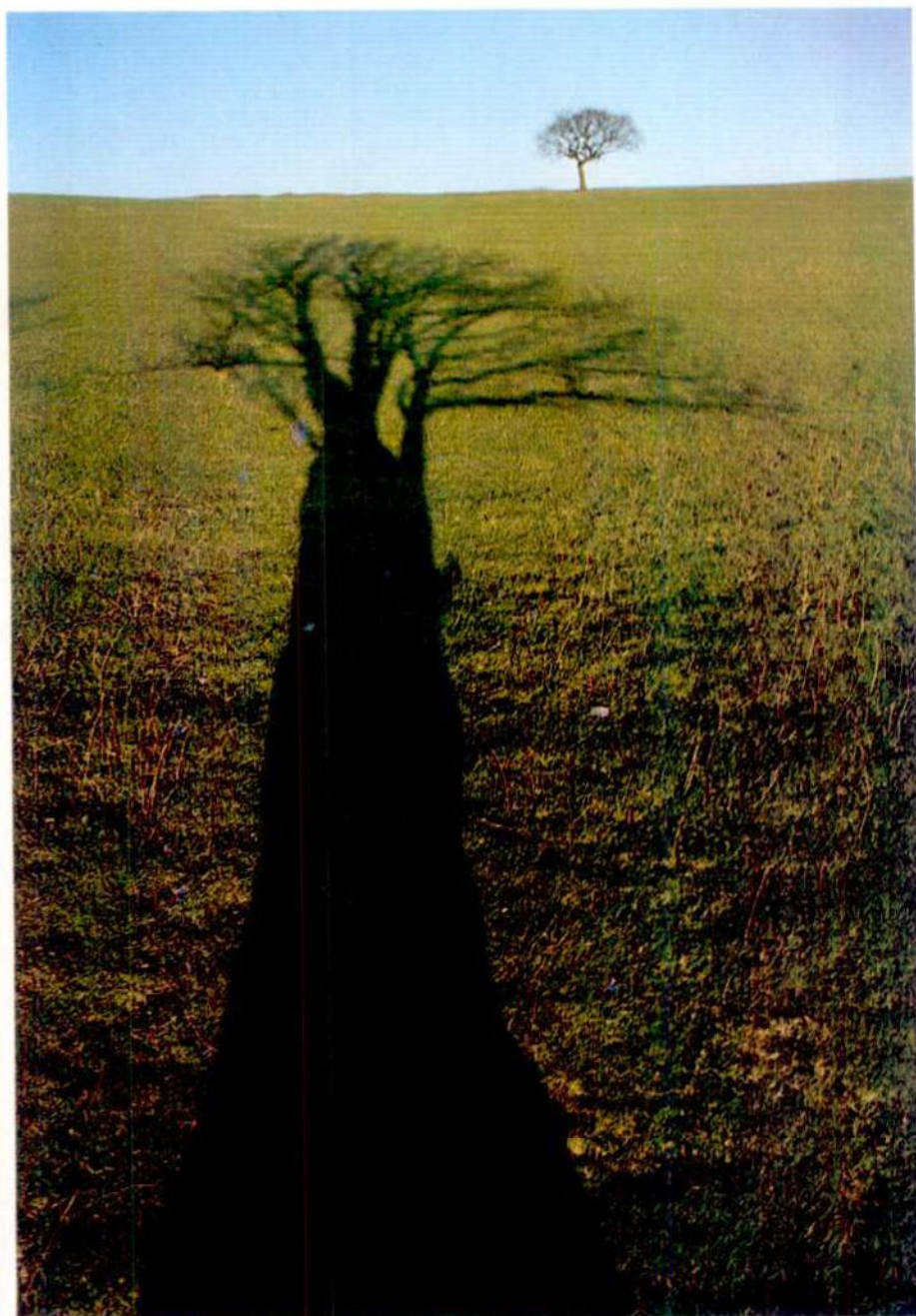
single light source creates a dramatic sense of form, leaving a face which is half in shadow, contrasting strongly with the lit area.

Palm Shadows from leaves can make unusual abstract patterns, which are particularly effective when seen against the background of other vegetation.

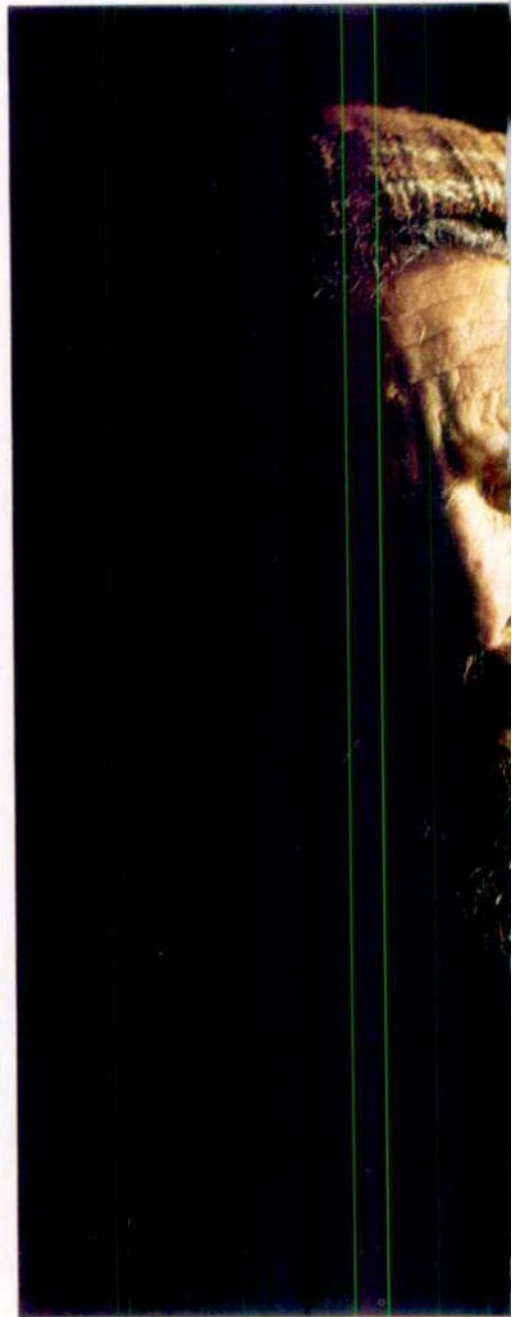
Red wall The shadow of a figure against a brightly coloured wall makes a subject in itself

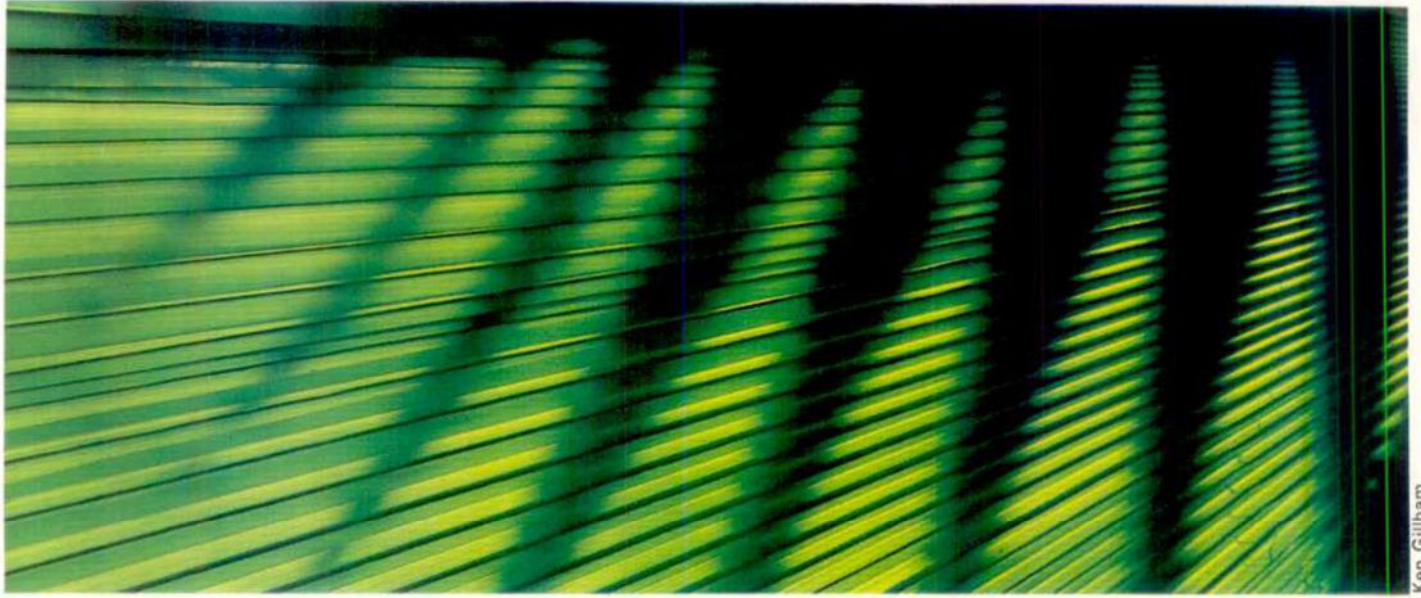


George S. Zimbel/Colorific



Colin Molyneux

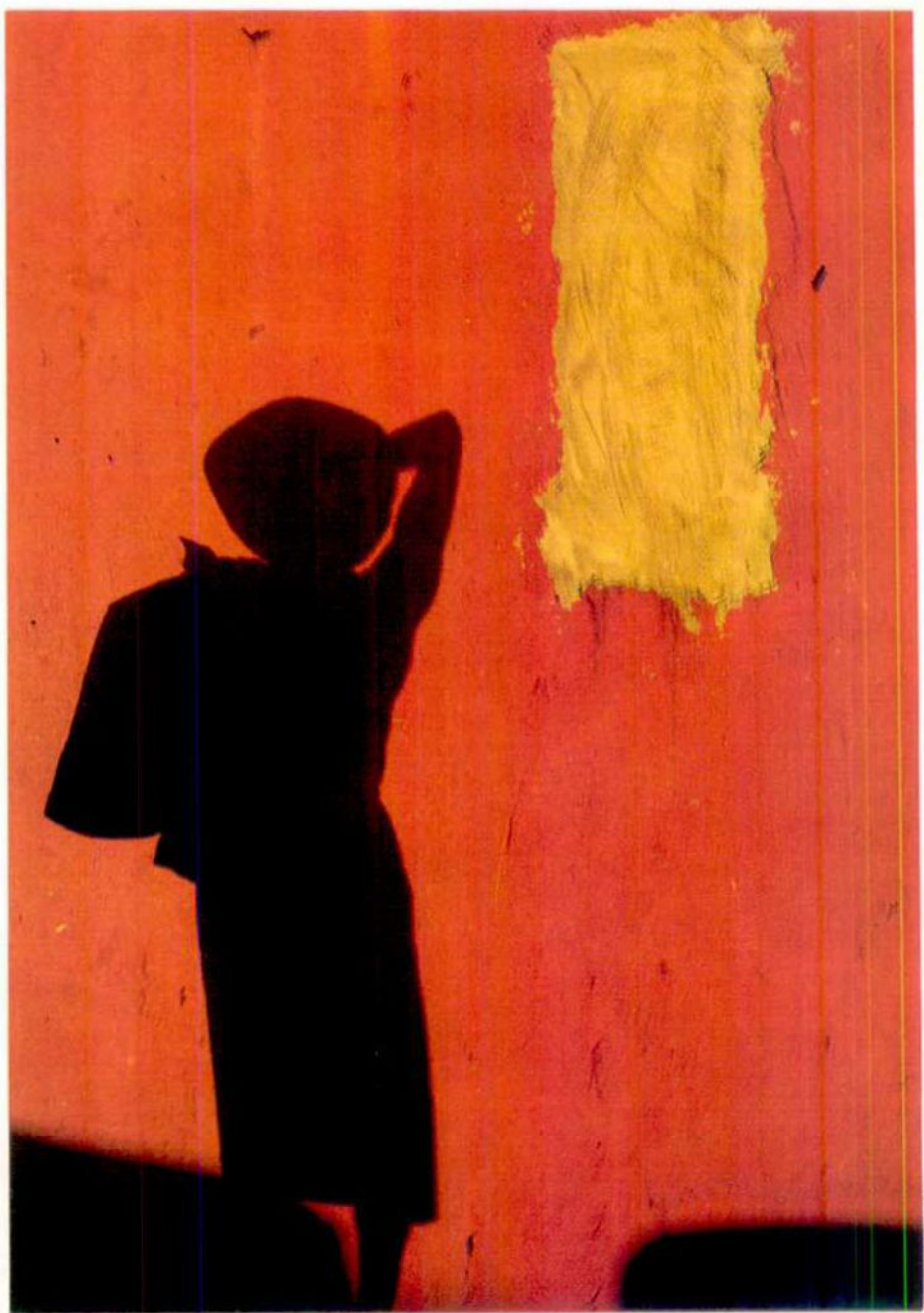




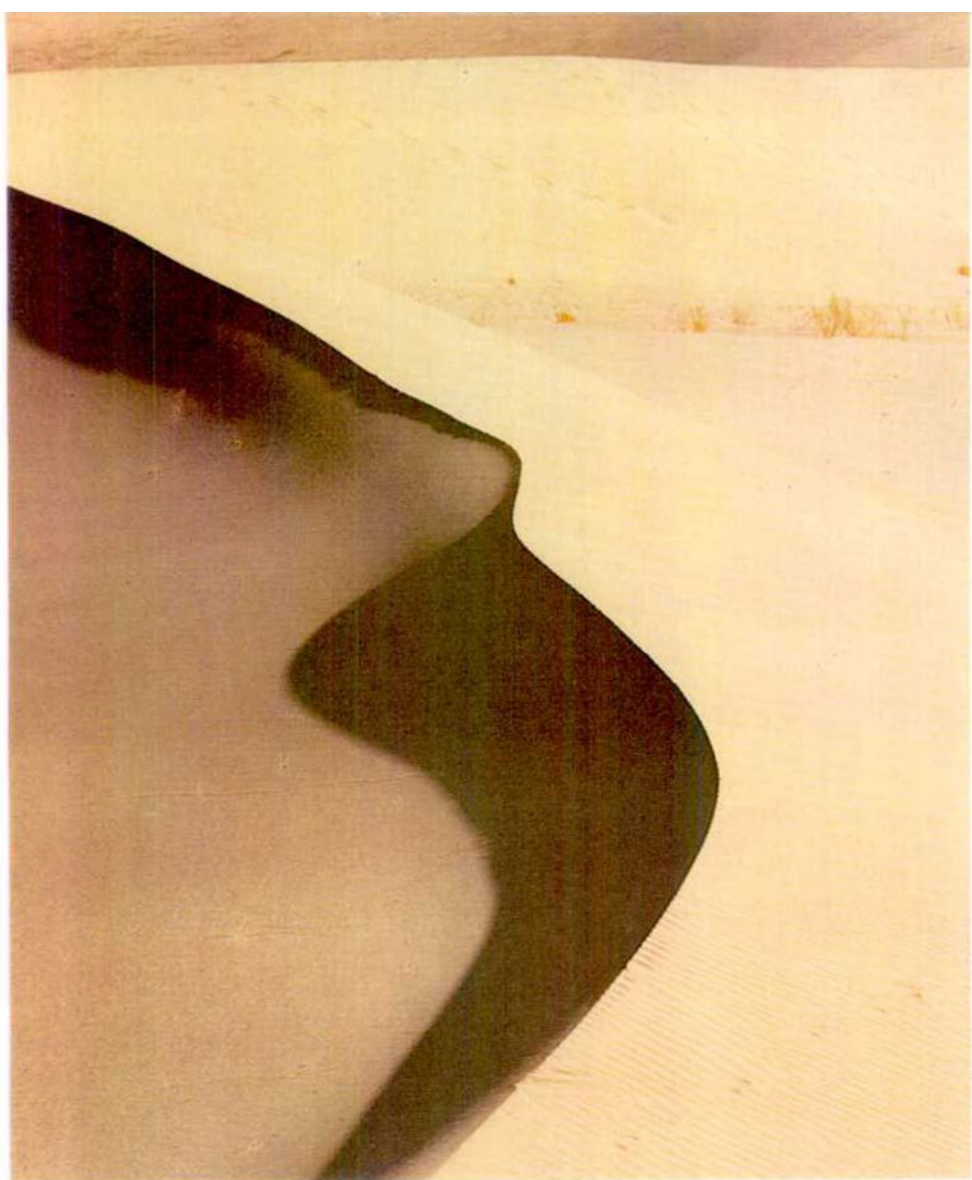
Ken Gillham



Homer Sykes



John de Visser



Adam Woolfitt/Susan Griggs Agency

bell, a car, a flower or plant—and use these in your compositions. If possible, move them around until you have the picture you want. You could set up your own images with shadows superimposed on real life backgrounds—the shadow of a person smoking a cigarette beside a no smoking sign, for example.

Besides using shadows as the main subject, consider including an object's shadow as part of the composition. Take care, since a background shadow can easily distract the eye from the main subject. This can be especially annoying when the shadow appears as an unrecognizable blob, distracting but giving no extra information. With a little more thought, and careful choice of camera angle and subject position in relation to the light source, background shadows can be used to add something to the main subject. A three-quarter view of a face, for example, might be enhanced by the inclusion of the shadow of a profile outlined on the wall behind. The shadows of leaves on a window blind could give some subtlety to a nude study, as well as helping to sculpt the surface of the body.

Strong, directional shadows can play a major part in the design of a composition, if you use them as an element of balance or perspective. In particular, look for shadows of people, buildings, trees or plants that stretch across a space in your picture, either helping to emphasize

Desert Shadow in this sort of photo emphasizes form and shape, and helps to reveal the pattern as well

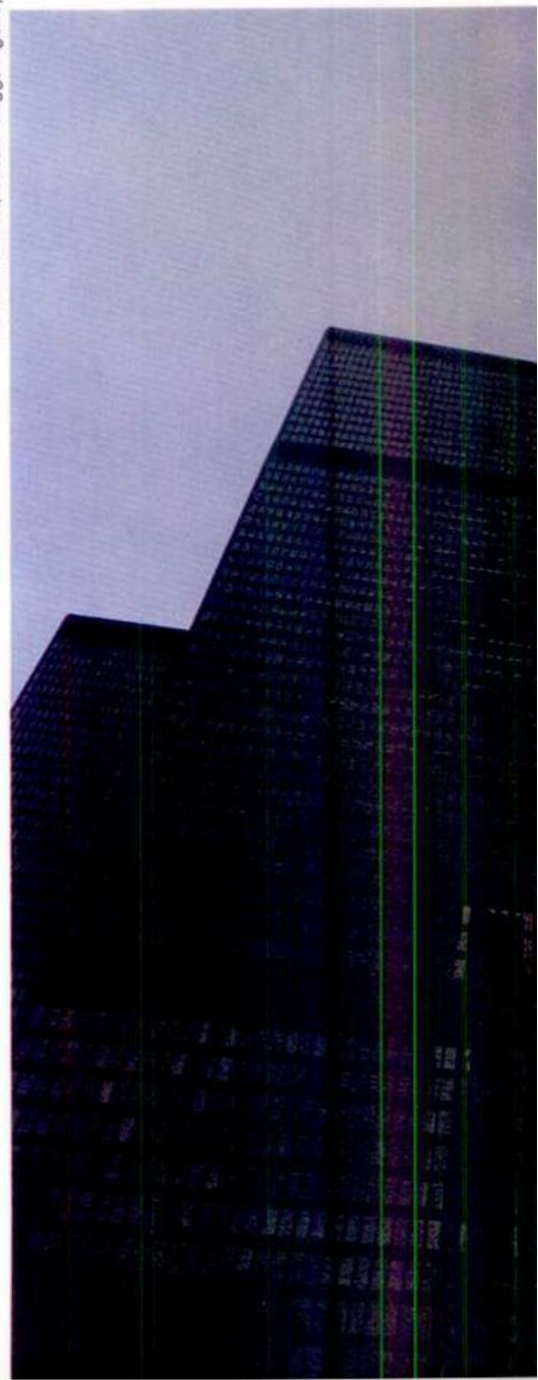
Tower block You can concentrate on one building as a subject, when a distracting background is in shadow

this space, or break it up into separate areas. The strong diagonal lines usually produced by such shadows can be incorporated into the composition to make a powerful abstract image.

Once you are aware, through your viewfinder, of the possibilities of abstract composition, you will find that you have the freedom to achieve images which bear little or no relation to the object you are photographing. An ordinary trellis fence, for example, seen at a certain time of day, either late in the afternoon or early in the morning, can produce a shadow that hardly resembles its true form, but results in an image that is both interesting and abstract.

While many shadows can be used as a representation, however distorted, of a recognizable object, there are other circumstances where the shadows have no particular form. These occur particularly at low angles of illumination.

As the sun sinks lower in the sky, the influence of shadow on, say, a landscape, becomes increasingly strong. An ordinary looking landscape at midday can be transformed by a pattern of

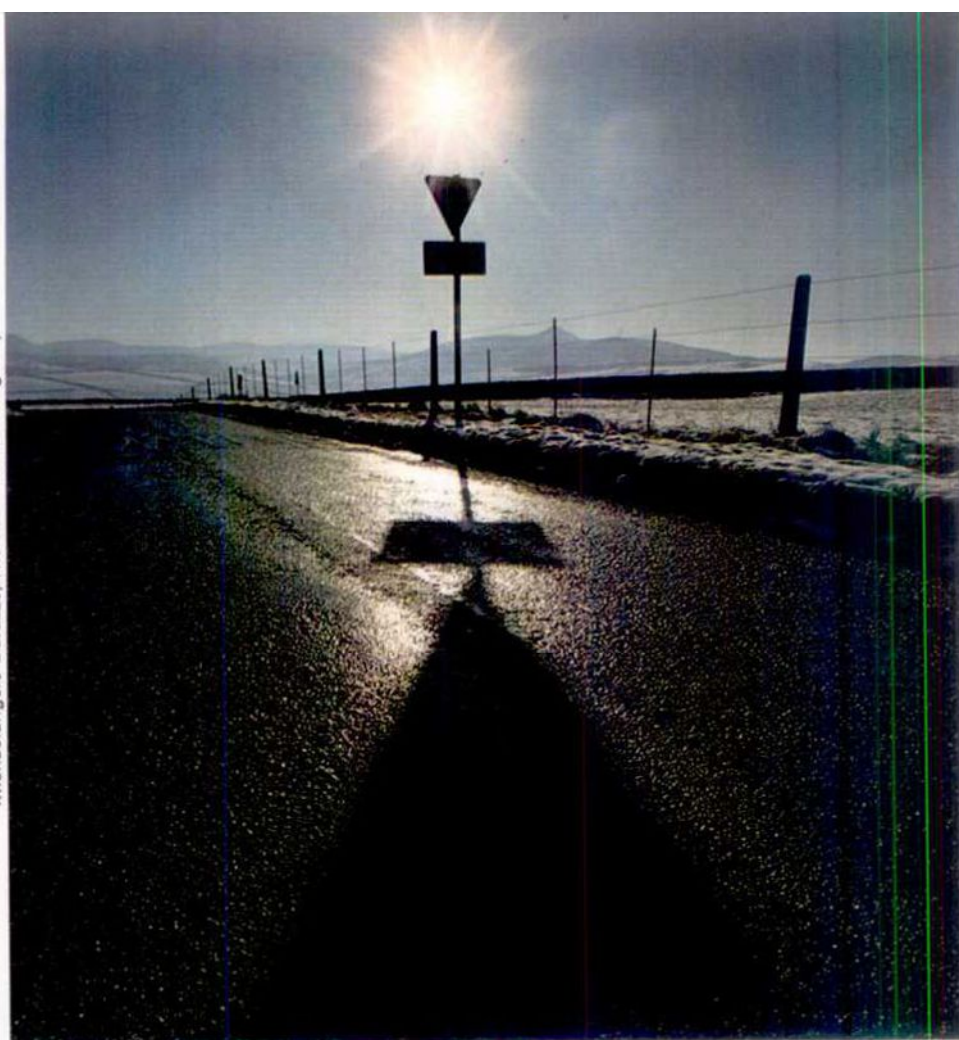




Michaelangelo Durazzo/The John Hillelson Agency



Isabelle Vigan



Ed Buziak

Road sign When the sun is low in the sky, shadows of simple objects lengthen and distort

Pram A cobbled street makes a good background texture to show off a spectacular shadow in black and white

shadows later in the evening. Architecture in particular benefits from the modelling that is produced by direct sunlight fairly low in the sky, whether early morning or late afternoon. This light creates shadows which pick out textural details, apart from emphasizing form. Architectural photographers will often not attempt to take a picture while conditions are overcast and no shadows exist. They know that the results will almost certainly be flat and uninteresting. With smaller objects, artificial light can be used to create modelling, but with large scale exteriors, the only thing to do is to wait for the weather to change.

Areas of shadow are useful when photographing a subject which has an amount of cluttered foreground detail that may be difficult to avoid. For example, you may wish to photograph a newly constructed skyscraper, but have found that the immediate foreground area is filled with the remains of building machinery, old scaffolding and other rubbish. Choose a time of day when the building is illuminated by strong sunshine, but when the foreground falls into deep shadow. This shadow will usefully absorb all the distracting details, which would otherwise interfere with your careful composition. Remember, however, to take an accurate exposure read-

ing from the highlight area so as to avoid details in the shadow. Another example in a completely different setting might be a formal portrait session where you have control over your lighting set-up, but where you wish to obscure a possibly distracting design on a dress or suit that your subject may be wearing—or perhaps wish to reduce the effect of a strong wallpaper pattern. Contrive to have the distracting material covered by a strong shadow which you can introduce by masking your principal light source.

Apart from using shadow merely as an element in your composition, it can be rewarding in itself. An area apparently obscured by deep shadows, can, on closer inspection, reveal extremely subtle and often beautifully muted colours, which would be impossible to capture by direct light. A portrait taken in bright light can yield details of skin and hair texture which may be unflattering. By slightly moving your subject into a shadow area, and adjusting your exposure accordingly, you will discover that those harsh elements of the former picture have disappeared, to be replaced by a range of more subtle tones that will flatter and enhance the portrait.

As well as being important in the creation of a particular mood, shadow is crucial in the delineation of form, and can add interest, drama and atmosphere to the composition, whether representational or abstract. Without shadow, images are flat and formless. Once you start looking for shadows many striking examples present themselves.

Carrying equipment

The very thought of carrying all your photographic equipment can be daunting enough to make you leave all but the basics at home. Buying a good camera bag or box, however, can make life much easier

While your photographic equipment consists only of a camera and a few filters, carrying it presents no problems. But as soon as you begin to acquire extra lenses, flashguns, light meters and other accessories, a proper carrying bag becomes a necessity unless you are prepared to take only the bare essentials on each assignment. Equipment can be simply flung in a cheap holdall, but for adequate protection a proper camera bag is needed. A proper camera bag also makes it easier to locate a particular item in a hurry.

Purpose-made camera bags are of two main types: soft 'gadget' bags and rigid cases. Soft bags are by far the most popular with both amateurs and professionals—except those who do most of their work in studios. Soft bags are

usually equipped with a shoulder strap and are light and comfortable to carry around. Although they cannot be secured against theft and offer less protection against damage than a rigid case, they are ideal for the photographer who wishes to move around quickly and easily with the minimum of fuss. On the other hand, for photographers who work mostly in the studio and carry their equipment between locations by car, the awkwardness and weight of a rigid case make little difference and the extra protection is usually worth the expense.

Soft bags

Although light synthetic materials such as leatherette and vinyl have largely replaced more traditional materials, the range and quality of soft bags on the

market is immense. For about the price of a roll of film, you can buy small bags that are little more than holdalls. They do not provide compartments for individual items and offer only the bare minimum of protection. If subject to any rough treatment, this type of bag almost invariably falls apart, but if you have only a few accessories and only take your equipment out occasionally, it may be perfectly adequate.

At the other end of the range, you can pay the price of a new camera and buy a bag that holds a considerable amount of equipment. Each item can be neatly stored in individual compartments and

Bags and cases *There is a huge variety of camera bags and cases to choose from but some are much better than others*





Hard cases A professional's alloy case is often tough enough for the photographer to stand on if a high viewpoint is needed, and offers better protection than soft bags

Dave King

the whole bag is tough and durable and provides a considerable degree of protection.

Clearly, when choosing a bag you must balance the quality against the price you are prepared to pay. But if you use your camera frequently, it may be better to spend a little extra and get a good quality bag—in the long term it can work out less expensive.

Good quality bags are generally made from proofed lightweight and durable nylon weave—similar to the material used in the more expensive rucksacks—although other materials may be equally good and canvas is still popular. The outer walls of the more expensive bags are often double thickness, including a layer of shock-absorbing polyurethane in between each skin. The polyurethane also helps to prevent the bag losing shape, making it easier to get into the bag in a hurry. The better quality bags at the cheaper end of the range also have a double outer skin but the filling is usually cardboard which loses its stiffness rapidly after heavy use.

Like the double outer skin, foam makes a much better material for the compartment divisions but again tends to be found only in the more expensive bags. With the cheaper bags the divisions—if there are any—are made of cardboard covered with fabric.

The size and shape of the divisions vary from bag to bag. In some bags,

the divisions are fixed and there can be a variety of compartments designed to take specific items of equipment such as cylindrical tube for lenses. This can be a disadvantage if your accessories do not quite fit the divisions, but the alternative, with movable divisions, is often less satisfactory. Movable divisions may be altered to suit your equipment—the walls are often attached in each new position with the aid of Velcro strips—but because the division must be flexible, small items can creep underneath and get lost or damaged.

Many bags also have small pockets on the outside and these can be invaluable, allowing easy and rapid access in pressing situations. But these pockets should be well protected by firm fastenings or a flap to ensure that nothing can drop out.

Look for protection in the base of the bag as well. In some of the cheaper bags, the bottom is not padded or stiffened at all. This means that if you put the bag down sharply on a hard surface, you could do considerable damage. The best bags tend to have both padding and stiffening—often a wooden board covered in polyurethane foam. A rigid base not only protects the equipment from dropping but also helps to ensure that the bag does not fold in the middle when carried on the shoulder strap.

Shoulder straps are often a weak point with the cheaper bags and it is worth looking for a bag with proper

reinforcement around the strap fastenings. Sewn-on straps are generally better than the clip-on variety. Look also for a strap that is attached to bands stitched right the way round underneath the bag, so that the bag hangs in a cradle from the strap. This band should also continue over the top of the bag and provide the mounting point for the handles. If the strap is simply attached to the end of the bag, the strain on the bag wall and stitching is excessive. Straps should ideally be about 5 cm wide and have a non-slip shoulder pad if the bag is to be comfortable to carry.

When examining the bag, however, do not look only for the obvious features—try to establish how well it has been made; a bag made from the best materials will fall apart in use if it has not been put together properly. Look in particular at the stitching. Gently pull the seams apart—if the stitches appear in the gap, the stitching is loose and will eventually give. Look also at the zips; they should be tough and smooth running but not loose. Any gap at the end of the zip can let in rain and should be properly covered.

Weatherproofing varies from bag to bag but very few could be left out in anything but the lightest of showers. If you live in a wet climate or intend to visit such an area, you should look for a specially weatherproofed bag. This could also be valuable in very dry con-



Wide straps It is always worth getting a bag with wide straps as these spread the load and make it more comfortable to carry

Made to last A well made camera bag is a work of art. Examine the fabric in detail for the use of quality materials. Look at the stitching, the zip and the way the strap is joined to the bag for signs of good workmanship

ditions where blown dust would penetrate any normal bag. Impressive claims for weatherproofing have been made for bags such as the American Tenba Pro-pack, which have been designed for Himalayan mountain expeditions. These have an external skin of PVC nylon canvas with a padded infill and inner waterproof liner. The top pulls down tightly over the edge and the bag is sealed with a fabric fastening and clasp so that it is completely weatherproof despite its low weight.

However, no soft bag will ever give your equipment complete protection, and if mobility is not important, it may be worth paying the extra for a rigid case with a gasket seal.

Rigid cases

Most rigid cases are made from aluminium alloy, although there are some plastic cases on the market. There are two different types of alloy case. The more expensive cases are manufactured from two shell halves of stress-formed aluminium. The interior is filled with a semi-hard foam giving much better protection than the cheaper soft foam used



Dave King/bags courtesy of M. Billingham & Co.



for upholstery, and the rim is fitted with a gasket seal, so that when the case is closed it is watertight and will float.

Cheaper cases use a wooden board structure covered in thin sheet alloy on the outside, with edge strips and corner protectors, and are lined on the inside with soft waffle foam on the lids and deep foam inserts in the body. Often the foam insert is divided into tear-off cubes, so that you can remove sections in crudely matched shapes to fit your equipment. However, the cubes tend to come loose, and you cannot 'rebuild' them easily. Some cases are bought complete with a block of foam and a knife to cut pieces suitable for packing your equipment. Unfortunately, any new equipment will not fit into these specially made shapes.

Alloy cases are used mostly by professional photographers who need rugged protection for expensive equipment.



Packed for pictures A well designed camera bag carries a surprising amount of equipment. You can even strap a tripod on to this bag

Small bag There is no sense in buying a large bag if you regularly carry only a single camera body and a couple of lenses



Many cases are so strong that you could easily sit or stand on them without causing damage. A case could give you just the extra height you need to see over the crowd. The extra height could also be useful if you have a waist-level camera and want eye-level shots without going through contortions.

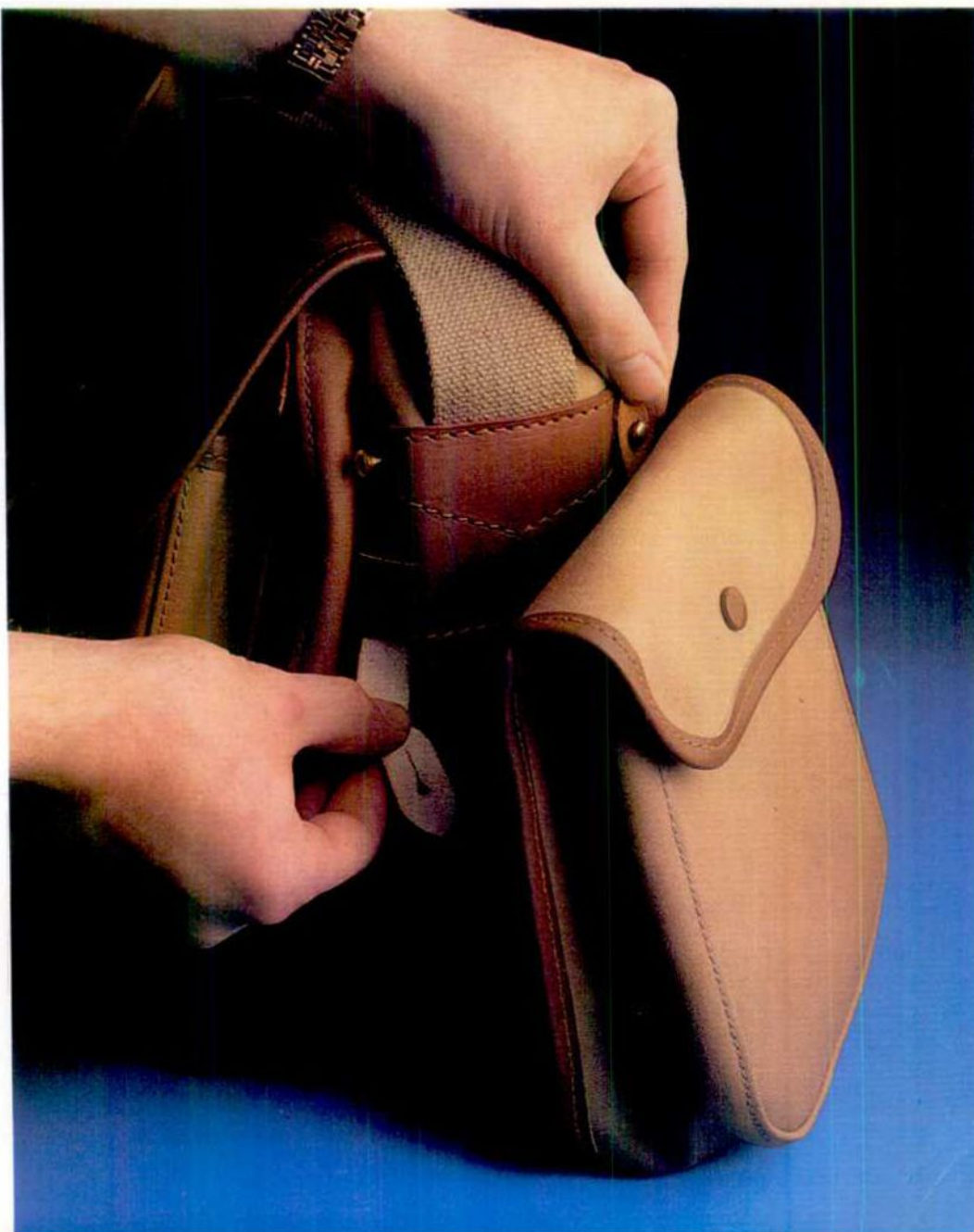
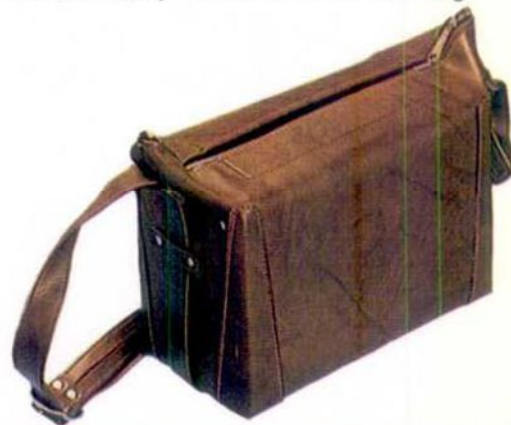
Although they may seem weak, plastic cases can actually be very tough and may be lighter than alloy types. You can find similar plastic cases made for the office briefcase market which are actually identical to the ones sold for photographers. You could buy foam to fit these, for less than the cost of the photographic version. The difference is that the photographic cases have side fittings for a shoulder strap and the office cases only have a carry handle.

Lightweight bag Inexpensive bags are worth buying if your equipment is minimal

Large bag Some professional camera bags are as large as a holdall. This one has clip-on pockets for carrying extra equipment

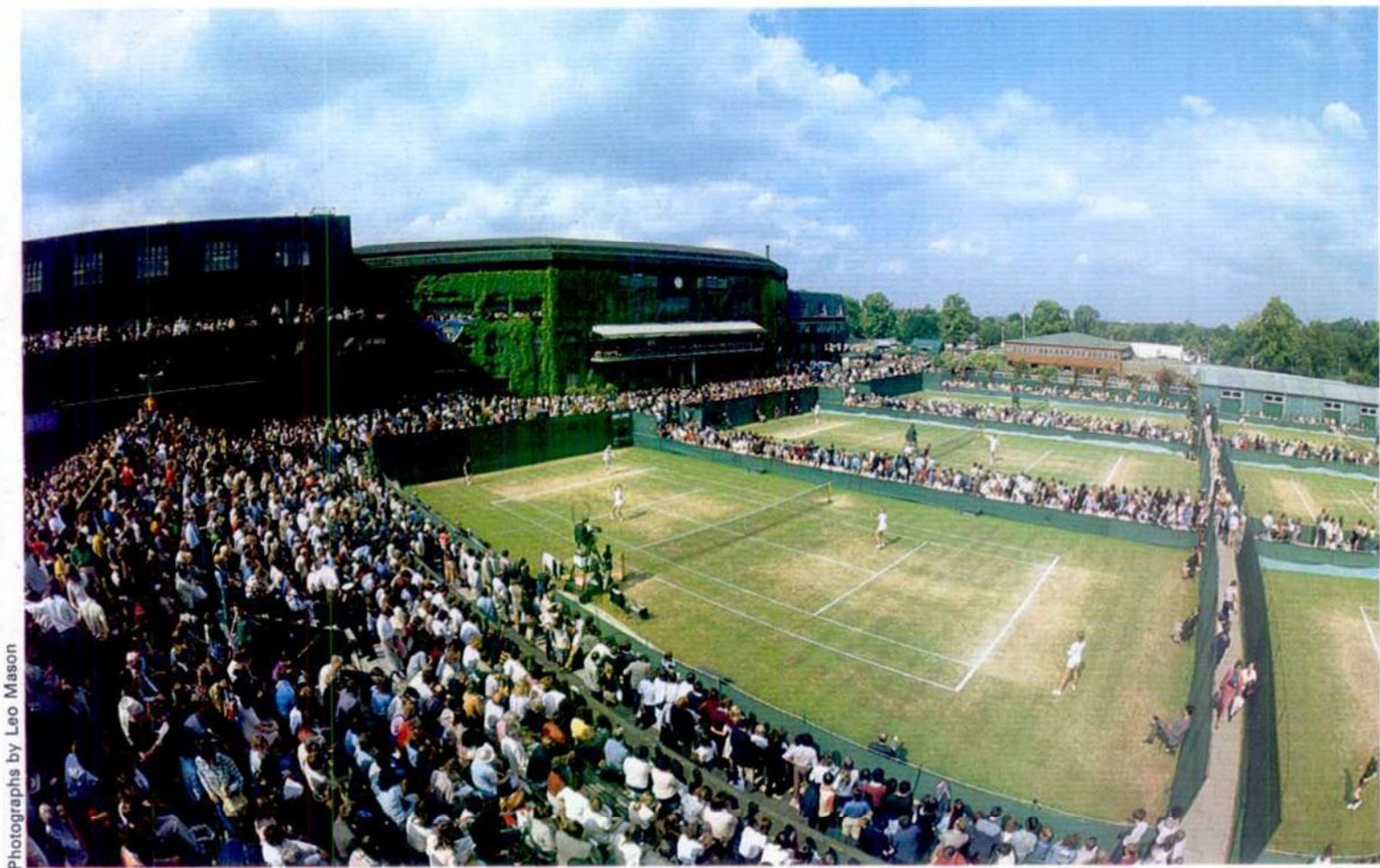
Which size ?

Once you have decided which type of bag to buy, you must decide what size you need. Obviously it is a mistake to buy a bag that can only take the equipment you have at the time of purchase but an overlarge, half empty bag can also be a nuisance. A compromise is necessary. If the make of bag you select has movable partitions or simply an empty main compartment, consider the longest lens you are likely to want to leave attached to the camera body when it is in the bag.



Wimbledon

Tennis tournaments allow spectators to get almost as close to the action as the professionals. With the right equipment and technique exciting pictures are within the grasp of the amateur photographer



Photographs by Leo Mason

To look at some of the problems involved in photographing a major tennis tournament, we look, in this assignment, at the work of Leo Mason—a highly acclaimed sports photographer who works on a wide range of events but specializes in tennis. Like other professionals, he has the advantages of years of experience of using press viewpoints, loads of film and the best equipment available. Often, however, the advantages that professionals enjoy are slightly overstated and amateurs who are prepared to make extra effort find that they can work from as strong a position as many professionals.

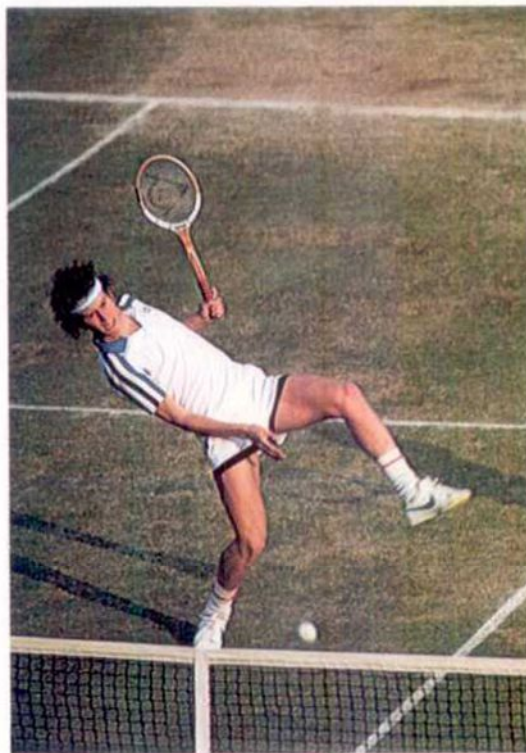
To get a good view of tennis action, try to get seats as close as possible to the photographers' enclosure. This is seen in the photograph of Platform B at Wimbledon where one public seating area is directly behind the press enclosure. Certainly a distance of even one metre can make a large difference with the viewpoint, but this can usually be made up by choosing your lenses carefully.

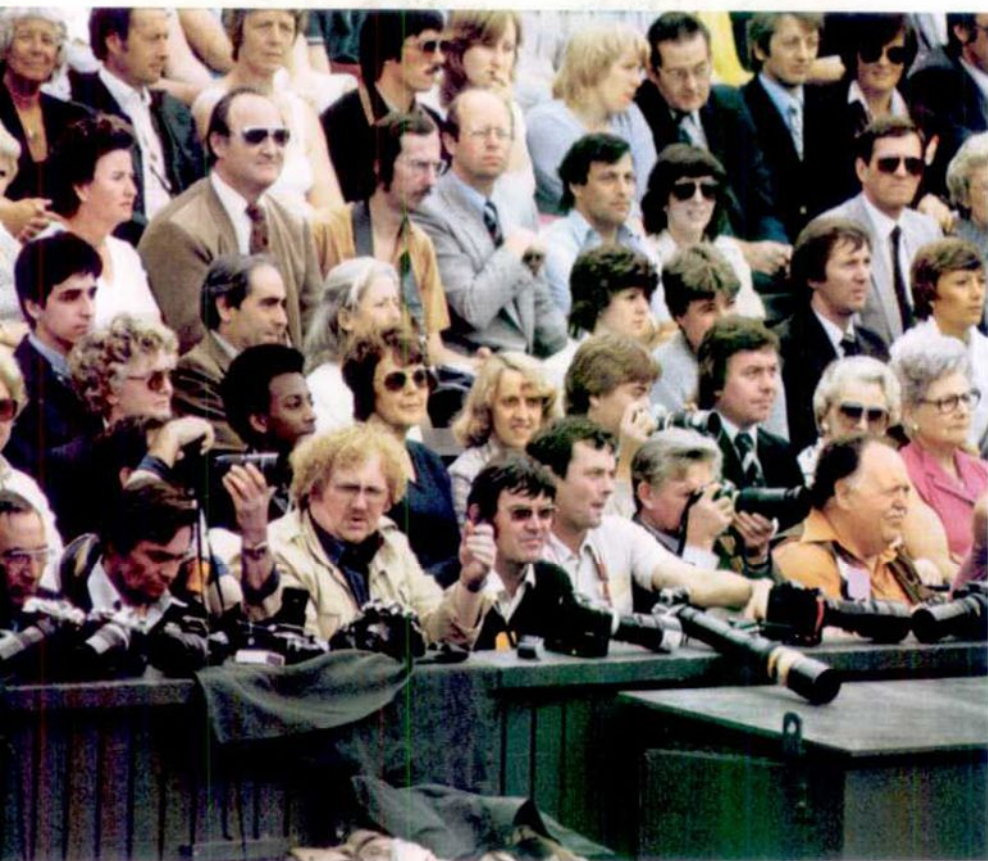
In terms of equipment, often the main

difference between the lenses that amateur and professional use is that the professionals have faster equivalents of the same focal length. Great shots can be taken with the slower lenses and if you want the extra speed you can always hire the best lenses available. If you do hire equipment, make sure that you familiarize yourself with it thoroughly beforehand.

Even though Leo makes use of the best equipment, he does not burden himself unnecessarily. 'I always travel fairly light because of the problem of getting around and because of the lack of space.' Stock takes up a fair amount of space alone—his choice of film type (he uses about 500 rolls during a two week tournament) was governed by the weather. He took Ektachrome 200 and 400 ASA for overcast conditions, and Kodachrome 64 for the bright, sunny days.

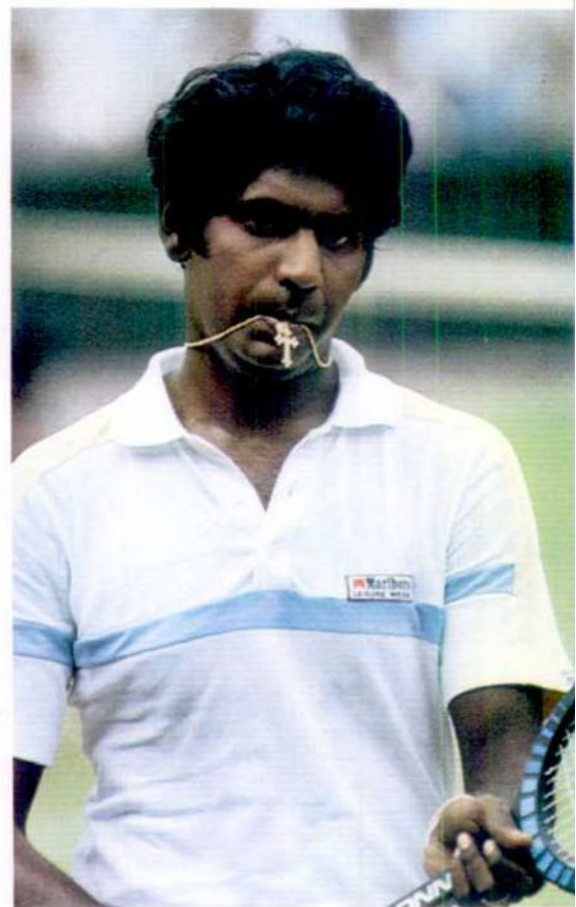
For lenses, he included a 16 mm full frame fisheye and an 18 mm for general views, a 135 mm for portraits of the players and, for action shots, 180 mm and 300 mm $f/2.8$ telephotos. The 300 mm lens is his favourite for shooting servicing





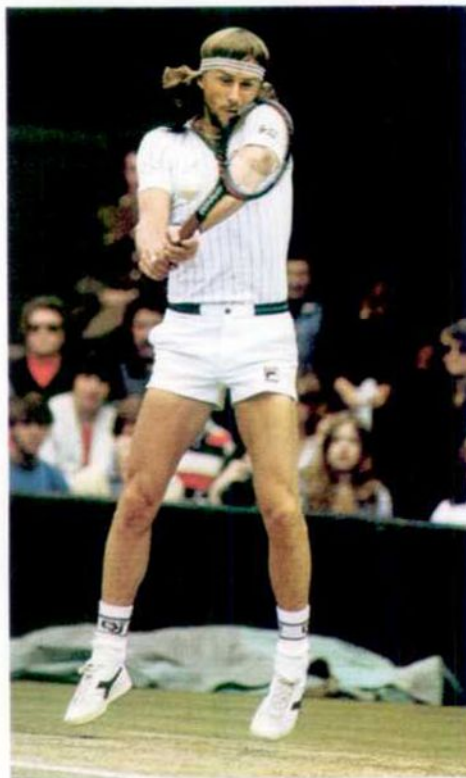
Platform B Although this position on Centre Court is reserved for the press, those sitting nearby in the crowd get a very similar view of the game

Vijay Amritraj Leo is always on the look out for the interesting angle. Shots without action can often capture the mood of the player better



Wimbledon For this view of the outer courts, Leo used a 16 mm fisheye and a Nikon F2. The sky was fairly overcast so he used Ektachrome

Action Leo found Bjorn Borg and John McEnroe two of the most difficult players to photograph. Their play was so perfect that getting interesting shots of them struggling for the ball was almost impossible. Both of these shots were taken with the 300 mm—Borg is on Ektachrome, while McEnroe and Fleming are on Kodachrome



players and baseline rallies and he often uses it with a TC 14 x 1.4 converter. With this combination he always uses a monopod for support.

'Knowing when to change lenses is partly a matter of experience and partly instinctive,' he said. He studied the style of each player extensively, and while photographing tried to anticipate every move. But he was always prepared for the unexpected.

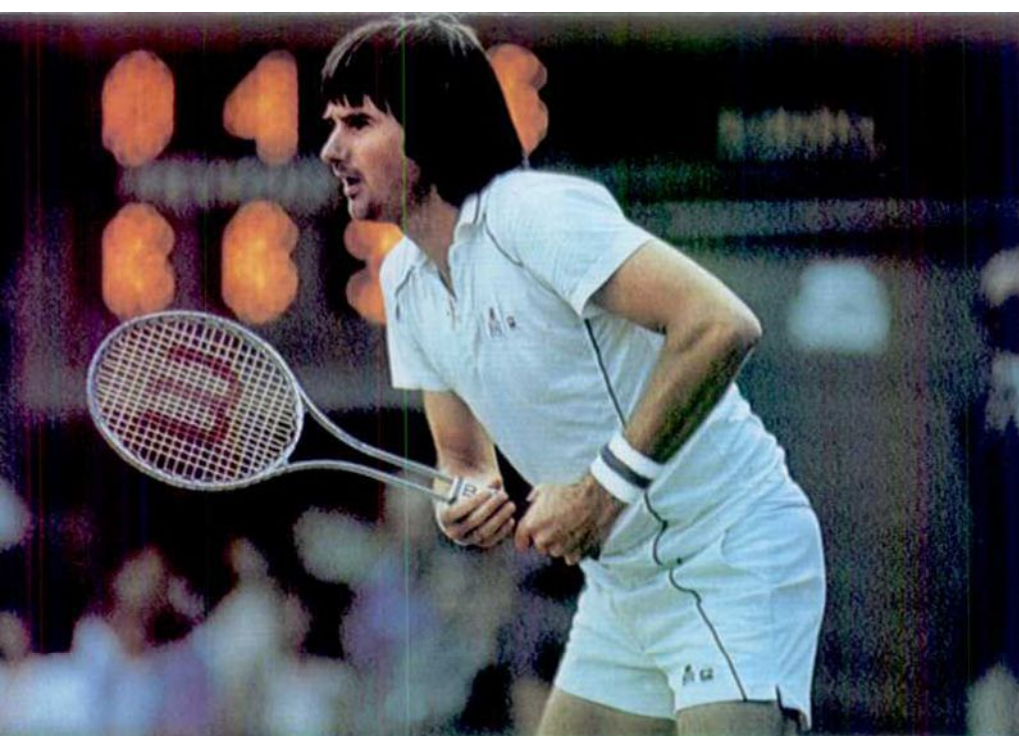
The lighting at Wimbledon was very unusual, particularly on the Centre and

Number One Courts. In the late afternoon and evening, the low sun threw shadows across large areas of the courts, posing severe problems for the photographer trying to follow the action.

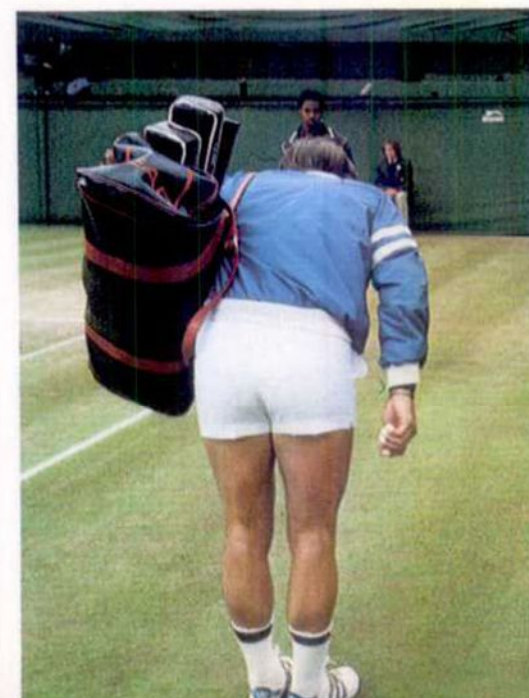
Leo offers a number of points of advice to the amateur covering an event like Wimbledon for the first time. First, two camera bodies are essential, with wide angle, 80-200 mm zoom and perhaps 300 mm lenses to fit them. You should take a variety of films of different speeds. He advised against using motor drives which may distract the players during the game. When framing a shot, wait until the shape looks just right in the viewfinder. Do not become obsessed with getting the ball in the shot—this used to be considered important but he thinks that it is less so now.

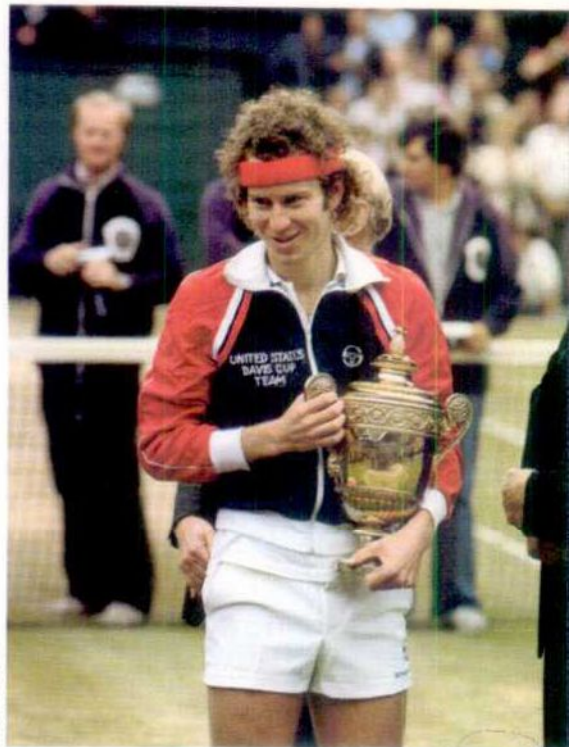
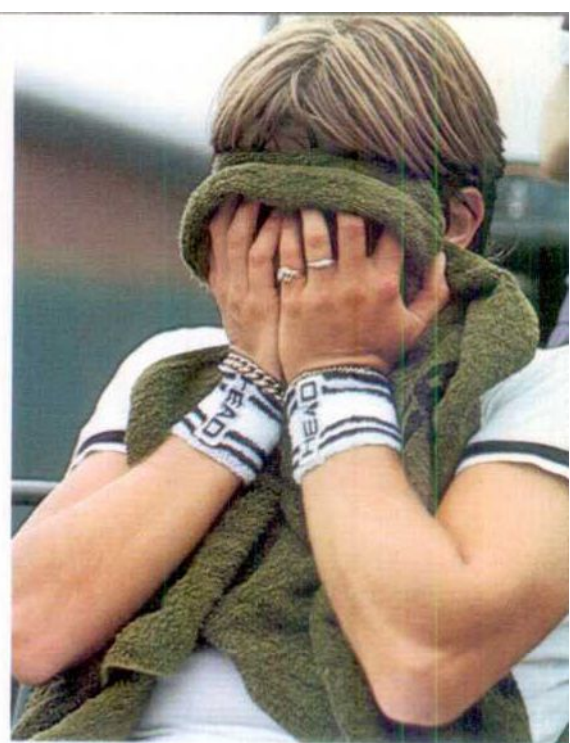
The best position in the crowd, he feels, is towards the centre of the court. You should be prepared to arrive early and wait for the position you want.

Finally, you have to be prepared to take instant decisions when deciding on the best type of shot with whatever lens you happened to have fitted. 'A lot of things happen so quickly that you don't have an awful lot of time to spend going through the niceties of photography.'



Jimmy Connors Leo always used maximum aperture whenever possible. This limited the depth of field and enabled him to draw out the subject from even the most distracting backgrounds. This shot was taken on Ektachrome with the 300 mm lens and $\times 1.4$ converter. **Chris Evert Lloyd** in action and beautifully sidelit on Number One Court. Kodachrome film was used with a 180 mm lens. **Tears** The emotion of Wimbledon captured on a 135 mm lens—Sylvia Hanika after losing in the first round. **Ball boy** An original shot on Ektachrome with the 300 mm and converter. **The Victor** A rare smile on the face of the 1981 champion John McEnroe—Ektachrome 200 and 135 mm. **Bjorn Borg** adjusts his wristband—Ektachrome with the 300 mm. **Downcourt** The 35 mm catches McEnroe and Fawley bowing to the Royal box. **Change over** Tracey Austin polishes her nails to take her mind off the match—180 mm lens





Leo Mason





Processing colour slides

No colour print can approach the brilliance and contrast range of a transparency. With a little time and care, you can process your own reversal films easily and cheaply

Processing colour slide film can be one of the most satisfying of all darkroom activities. It leads directly to beautiful finished photographs of the highest quality, and yet is quite within the capabilities of anyone who is prepared to work carefully.

There is no quicker way of seeing the results of your colour photography, other than using an instant camera with all its limitations. You can be projecting top quality slides within an hour or so of taking the pictures, without sacrificing the film's performance.

There are two slide processes suitable for home use. One is matched to the Kodak Ektachrome system and is called the Ektachrome Process E-6 (which is shortened, simply, to 'E-6'). The other is matched to the Agfachrome system and is called Process 41, or P41.

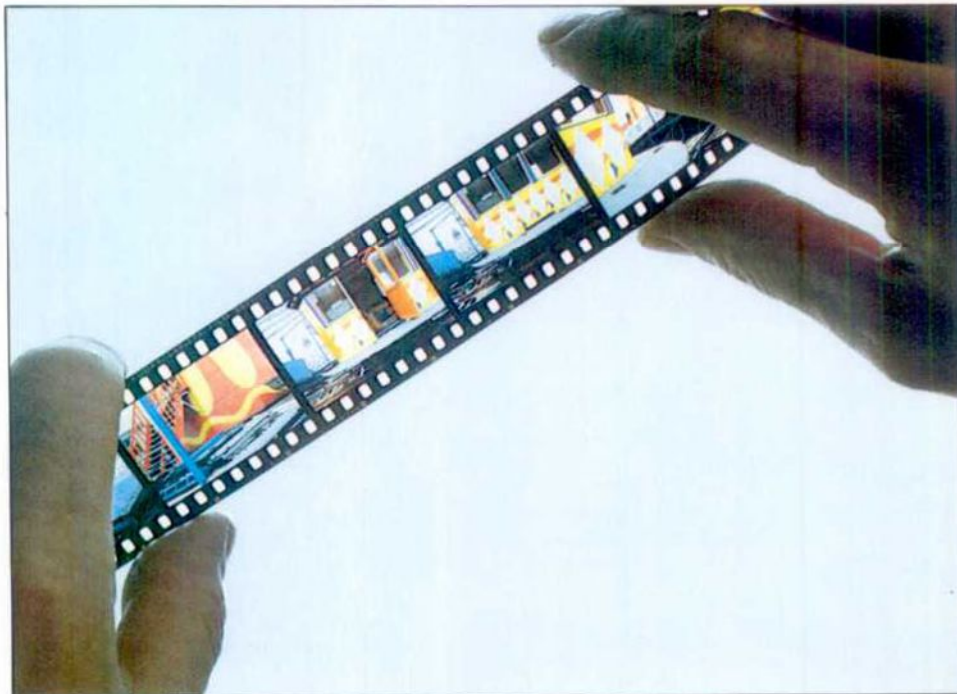
You can process any E-6 compatible film using either Kodak's own E-6 process kit or the E-6 kits from independent manufacturers, of which there are several. Suitable E-6 films include the Ektachromes, Fujichrome and a number of 'own label' brands. If you are in any doubt, check the processing instructions which accompany the film carton for mention of E-6. You cannot, for example, process Kodachrome, or films intended for E-4 processing.

The P41 process is used for Agfachrome type films. The choice of films varies from country to country but the true Agfachrome (50L, 50S and 100 Professional) are widely available.

Each system has its pros and cons. You might find that one process gives more faithful colour rendering, or that it produces more brilliant, saturated colours. Agfa takes longer to process, but the E-6 process requires higher temperatures, needing careful control. Even with E-6, a water bath is usually adequate for maintaining the correct temperature, but for complete reliability a processing machine has several advantages. Not only does it keep temperature constant, but it agitates the tank evenly, taking the drudgery out of the job, and guarantees absolute consistency.

The E-6 process

The latent image, recorded in the three emulsion layers of the film, is developed in complete darkness by the first developer. This produces a negative image composed of metallic silver which is similar to an ordinary black and white negative (see page 578). The action of this developer, however, is much more sophisticated than that of an ordinary



David Robinson

developer. Ultimately, it is responsible for the overall density of the image, as well as governing the formation and reproduction of its colours. It is the single most important stage in the whole process—and one of only two where time and temperature are critical factors.

The standard processing temperature for E-6 is 38°C, with a maximum leeway during first development of plus or minus 0.3°C. The normal first development time is six minutes using the Kodak chemicals. All the usual precautions over time, temperature and agitation must be taken to prevent unintentional over- or underdevelopment.

A brief two to three minute wash follows first development. You can use several changes of rinse water at between 33°C and 39°C if running water at this temperature is not available. You may use spare water from a water bath for this job, but it must be clean.

The wash removes excess developer and so prevents the development from continuing. The next stage is a reversal bath of two to three minutes duration, again using solution at a temperature of between 33°C and 39°C. In the reversal bath, the emulsion becomes laden with a potentially active reversal agent. This activity is triggered by the colour developer which follows. Fogging centres form on all the silver halides which were left unexposed by the camera exposure, and were therefore left untouched by the first developer. This is an

Better colour A transparency is viewed by transmitted light, and shows more brilliant colours than a print

essential part of the colour formation phase, and it is important not to give less than a minimum time in this bath.

It is safe at this stage for you to open the processing tank and continue with the remaining steps in full lighting. You may find it less troublesome, however, to continue with the film safely contained within its tank. The film now looks like a very dense but unfixed black and white negative film.

The residual silver halide, which is now developable, is converted to a dye image by the colour developer at 38°C ± 0.6°C. The duration of this bath is between six and eight minutes. To make sure that the colour developer acts quickly, agitate the tank continuously for the first half minute.

Colour couplers contained within the three emulsion layers react with the colour developer to produce the yellow component in one layer, the magenta component in another, and the cyan component in the third layer. Dye is formed only in those areas where no metallic silver formed during first development.

If you look at the film at this stage there is no sign of colour—all you see is dense black because the image dyes are still covered by metallic silver. The function of subsequent processing stages

is to remove the silver formed during the first and second development, leaving behind only dyes which combine to form a coloured image.

In some E-6 processes, including Kodak's own, an intermediate conditioning bath follows. This effectively neutralizes the actions of the colour developer as well as inhibiting undesirable secondary reactions, which can lead to streaks or patches of coloured fog. A more conventional stop bath is used in some other E-6 processes. The duration, in either case, is two to three minutes at a temperature of between 33°C and 39°C, a range used for all other processing stages which follow. If a conditioning or stop bath is not used, a one minute rinse in several changes of water should be sufficient to clear excess colour developer.

The bleach bath which follows converts the metallic silver and certain other waste products into compounds that are easily removed afterwards by immersing the film in a fixing bath. In some E-6 process kits, these two baths are combined. Whatever form is used it is important to bleach and fix for at least the time recommended. There is no harm, however, in prolonging this stage if you are uncertain about the strength of the solutions or if the temperature has dropped slightly.

The water soluble compounds can now be removed in the final wash. Wash the

film for about four minutes using running water within the process temperature range. Use a succession of individual rinses if this is more convenient.

An optional but recommended final stage is to immerse the film in stabilizer before hanging it up to dry in a suitable dust-free position.

Upgrading with E-6

By making small adjustments to the first development period, it is possible to obtain acceptable transparencies from films which have been exposed at other than normal film speed ratings. While this is true for all user-processed slide films, Ektachrome type films respond particularly well to this treatment. There is inevitably a loss of picture quality, but this is usually tolerable if the only alternative would have been not taking the pictures.

A film knowingly underexposed by one stop—that is, exposed as if it were a basically faster film—can be rescued by increasing first development from six to eight minutes. One and a half stops underexposure requires increasing the time to ten minutes; two stops underexposure by a further minute and a half. The limit of correction in the case of overexposure is about one stop, achieved by reducing the first development to four minutes.

In conjunction with the faster Ektachromes, increased first development can yield some impressive film speeds

which are very useful for various fields of photography where low light poses a problem. If you intend to upgrade your film for work of this kind, make a series of test exposures and try out various first development times before committing yourself.

Agfachrome processing

The Agfa P41 process differs from the E-6 process in one important respect. Whereas image reversal is achieved entirely by chemical means in the E-6 process, in the P41 process the film has to be re-exposed to white light at a point between the first development and colour development stages. This is done simply enough by removing the film from the processing tank and exposing it to a suitable bright lamp. All subsequent processing stages may continue outside the tank if this is more convenient.

The duration of this second exposure depends on the strength of the lamp you use and its distance from the film. It must be sufficient to fog all the unused silver halides which remain in the film after first development. If the lamp you use is sufficiently bright, you do not need to remove the film from a plastic spiral. A 150 watt bulb is ideal. Remove the spiral from the tank and expose each side for about a minute at a distance of about 30 cm from the bulb. Be careful not to splash the hot lamp as the bulb may



1 Pour measured amounts of solutions into bottles and place them in the water bath or processing machine



2 Set the right temperature on the machine, or fill the water bath with water at the process temperature



3 Check the temperature of the water bath. A machine may take some time to reach the correct heat



4 Pour the first developer into the tank. If using a machine, quickly place the tank in its revolving mount



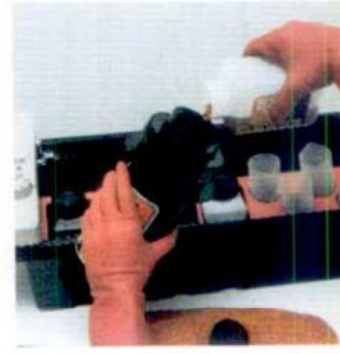
5 Agitate the tank during the development time. Drain the developer and rinse the film ready for reversal



6 With the E-6 process, pour in the reversal bath. Rinse, pour in colour developer and wash, ready for bleaching



7 With the P41 process, re-expose the film as shown. Replace it in the tank, give colour development and wash



8 Pour in bleach, rinse, fix and wash as instructed. Some kits combine bleach and fix, eliminating one stage

shatter. If you use a more powerful bulb, keep the film far enough away to avoid scorching the film.

A stainless steel spiral cuts out too much of the light, so if you are using one of these, first remove the film. Do this carefully so you do not damage the emulsion which is very delicate when wet. For short lengths, hold the film taut, an end in each hand, and seesaw the film past the lamp. Make sure every part of the film receives at least a minute's exposure and, to be on the safe side, expose both sides of the film.

This technique can prove difficult for long lengths of film and a useful way to get around the problem is to unspool the film carefully into a white bowl containing water at, or near, the correct process temperature. Point the lamp into the bowl and give a two minute exposure, rotating the bowl so that every part of the film receives sufficient exposure. Afterwards, place the spiral in the bowl and carefully respool the film—you will find it safer, and easier, to do this under water.

This method has certain advantages and it is therefore worth adopting even when you are using a plastic spiral. The water protects the film from excessive lamp heat, and the bowl ensures all-round exposure. Simply place the loaded spiral flat within the bowl and expose each side in turn—again, for about a minute at 30 cm from a 150 W bulb.

Because of the varying colour output of different types of tube, fluorescent lighting is not always suitable for the fogging exposure. So use only tungsten

lighting—or even daylight if a bright enough bulb is not available—to make sure that the colour balance of the film is not put at risk.

Whatever form of lighting you use, make a point of giving more exposure if you are in any doubt. Excessive re-exposure has little effect on final results—in fact all remaining processing stages may be carried out in full lighting, as in the case of the E-6 process.

In other respects, the Agfa P41 process broadly resembles the E-6 process, but it does not normally end with a stabilizer bath, in common with some of the independent E-6 process kits. Two process temperatures—20°C or 24°C—may be used, the lower one being suitable where temperature control may present problems. The whole P41 process, which includes more intermediate (washing) stages than the E-6 process, is particularly lengthy and this point should be considered when planning your working methods.

Upgrading Agfachromes

The Agfachromes can be processed to correct for small errors in exposure. As for Ektachromes in the E-6 process, this is done by making small adjustments to the first development time. Although it is best to establish your own times, by trial and error, for future adjustments to the standard Agfachrome film speeds, as a guide you can correct under-exposure and overexposure of about one stop by lengthening or shortening first development by 20 per cent. This would mean, for example, increasing the

normal first development time of 13½ minutes (in the 24°C process) to 16 minutes to correct for a known case of one stop underexposure—or shortening it to 11 minutes in the case of one stop overexposure. Fractional corrections can also be made—a half stop exposure error can be corrected by a 10 per cent change in first development.

Changes to first development do not affect the relative grades of contrast within a picture, but any increase of first development reduces the density of the darkest, least exposed areas of the film. Up to about a one stop correction has little significant effect on the colour quality of the image. It is possible, however, to raise film speeds beyond this point by making substantial changes to the first development time. If you can accept the inevitable loss of colour quality, such uprating techniques offer some intriguing possibilities, which are discussed fully in a subsequent article.

Capacity and storage

For consistent results you should always use fresh solution, but for maximum economy you can process several films more than recommended with a given amount. Beyond a certain point, however, quality of results inevitably suffers. Kits contain detailed instructions for re-using solution. Follow them closely when mixing chemicals, and always wear gloves, because some can cause skin irritation. Keep chemicals in clearly labelled bottles, out of harm's way, and only mix up what you need, because developer solutions do not keep well.

Colour slide film processing

Processing stages	Kodak Ektachrome Process E-6		Photocolor Chrome-Six		Unicolor E-6		Agfachrome P41 at 20°C		Agfachrome P41 at 24°C	
	Time mins	Temp°C	Time mins	Temp°C	Time mins	Temp°C	Time mins	Temp°C	Time mins	Temp°C
Preheat	—	—	1	43	1	40.6	—	—	—	—
First developer	6	38±0.3	6½	38	6½	40.6	19	20±0.2	13½	24±0.2
Wash	1½–3	33–39	2	34–42	2–3	40.6	¼	14–20	¼	20–24
Stop bath	—	—	—	—	—	—	4	18–20	3	22–24
All remaining processing may be carried out in normal lighting										
Wash	—	—	—	—	—	—	10	14–20	7	20–24
Reversal bath	1½–3	33–39	2	34–42	2	40.6	—	—	—	—
Re-exposure	—	—	—	—	—	—	see footnote		see footnote	
Colour developer	6–8	38±0.6	6	38	6	40.6	14	20±0.5	11	24±0.2
Conditioner	1½–3	—	—	—	—	—	—	—	—	—
Stop bath	—	—	—	—	1–2	32–43	—	—	—	—
Wash	—	—	1	34–42	2–3	32–34	20	14–20	14	20–24
Bleach	6–8	33–39	—	—	3–4	32–43	5	18–20	4	22–24
Wash	—	—	—	—	—	—	5	14–20	4	20–24
Fix	3–6	33–39	—	—	2–3	32–43	5	18–20	4	22–24
Bleach Fix	—	—	8	34–42	—	—	—	—	—	—
Wash	1½–4	33–39	4	34–42	2–3	32–43	10	14–20	7	20–24
Stabilizer	½–3	33–39	—	—	1–½	—	—	—	—	—
Ambient Below 60										
Dry										
Total time (ex dry)	27½–44 minutes		30½ minutes		28–34½ minutes		93½ minutes		68¾ minutes	

- Notes: a) For the re-exposure of Agfachrome, hold film 30 cm from 100/150W bulb for one minute each side
b) Another widely available E-6 kit is Tetenal's UK6. Use and times are almost identical to standard E-6

Dedicated flash

If your flash pictures repeatedly show faults arising from simple mistakes, using a dedicated flash may solve your problems. These automatically set the correct speed and, often, the correct aperture



its special features.

Dedicated flash can only work with cameras that have electronically controlled exposures, and which have been designed with dedicated flash in mind. These will have a means of electronically linking the film speed, shutter speed and aperture between the camera and flash. This is usually achieved by means of contacts on the camera's hot shoe.

Most units are 'dedicated' to one or two cameras from a manufacturer's range. They can be used only with the cameras for which they are intended. In addition, several independent flash manufacturers make units that will suit particularly popular models of camera.

A dedicated unit looks much the same as a non-dedicated unit of comparable power, but it will cost 20 to 30 per cent more because of its more sophisticated electronics.

What can a dedicated flash do?

Different units have different facilities but one function performed by even the most basic dedicated unit is that of setting the camera's shutter speed to the flash synchronization speed. This is only possible on cameras with an automatically set electronic shutter—either those with aperture priority automation, or with a manual dial which is nevertheless an electronic control. To achieve this, a contact on the flash hot shoe either completes a circuit on insertion, setting the shutter speed to the correct one for flash (usually 1/60 or 1/125), or feeds a current through to a circuit which does the same only if the flash is switched on as well as inserted.

A slightly more advanced unit will both set the speed and indicate when the flash is ready for use by a light signal in the viewfinder. This means that you can keep your eye to the viewfinder and shoot as soon as the flash is ready, without the need to look at the flash for the ready light. When the ready light on the flash comes on, a similar light in the

A huge number of photographs are taken using flash. Unfortunately, flash is notoriously difficult to handle, and many pictures are spoiled because the photographer made a simple blunder. Two common mistakes are setting the wrong shutter speed and using the wrong aperture for the subject's distance.

These two features are often (on modern cameras) under automatic control. It is therefore feasible to arrange things so that as soon as the flashgun is attached to the camera, the correct shutter speed is set automatically and, in some cases, the camera is automatically set to the correct aperture. Such a system, where the automatic systems of the flash and camera are linked, is called dedicated flash. The word 'dedicated', used with reference to equipment, means that the unit is designed specifically to work with a particular model—it cannot be interchanged with others. This inevitably means that a dedicated flash unit must be bought with your camera in mind, to suit

Dedicated flashes Most cameras with electronic exposure control can be fitted with a dedicated flash gun

Hot shoe and connection The metal studs at the base of the gun make the electronic connections to the camera



camera does the same.

More sophisticated dedicated flash units set the flash speed only when they are ready for use. Until the ready light comes on, the shutter speed display scale continues to work as normal and will give auto exposure readings for the prevailing light. As soon as the flash is ready, all systems switch back to the fixed flash speed. If you have forgotten to switch on the flash, therefore, your picture will be correctly exposed though probably blurred as a result of a long exposure time.

Dedicated flash units may have a number of further features. Aperture signaling displays in the viewfinder the *f*-stop which the flash requires for good exposure using its auto sensor. On aperture priority cameras, the photographer must remember to set this. In this case, the photographer must also set the speed of the film in use on the flashgun, as normal. However, if the dedicated unit has ASA film speed setting, it will transfer the film speed set on the camera directly to the flash.

On a shutter priority camera, however, the *f*-stop itself is normally set on the basis of electronic signals from the light meter, shutter speed control and film speed dial. This makes it possible to set the aperture to that required by the flash unit, as well as provide the other functions. The shutter speed set on the dial is electronically overridden by the dedicated flash. This facility is called auto aperture setting.

Not all shutter priority cameras, however, can offer this. Some cameras, such as the Minolta XD and Fujica AX series, monitor the light continuously even as the lens iris closes, firing the shutter at exactly the right moment. These cameras therefore do not control the aperture in the same way, and auto exposure setting is not possible.

Most flashguns offer automatic exposure only at one or a few *f*-numbers, to which the camera must be set. The correct amount of light is metered by a sensor on the gun itself. But on some



John Sims

cameras, such as the Olympus OM-2, the Contax Quartz 139 and 137 and the Pentax LX, the flash reading is metered off the film during the flash discharge itself, and the light is cut off as soon as enough has been received by the meter cell. Such a system demands a dedicated flash offering TTL auto flash metering. This eliminates completely the need for fixed aperture settings, as opening up a stop simply halves the light output of the flash and vice-versa.

Fill-in flash by daylight—synchro sunlight—is best handled by systems which meter off the film, and only works on an SLR when the shutter speed required for the conditions is longer than the flash

sync speed. The Contax, Olympus OM-2 and Minolta CLE rangefinder can all be used with flash to brighten up backlit shots outdoors.

Some dedicated flashguns have a special low power switch. This is intended for use on a camera with the manufacturer's own motor drive, which has a set shooting rate. It limits the power of each shot. This necessarily means wide apertures, but the facility allows you to freeze action very successfully.

Independent dedicated guns

The major independent flash manufacturers make guns which may be switched or adapted to fit a whole range



Olympus T32 You can use the T32 as an ordinary automatic flash, or it can be linked to the OM2's meter



Nikon Speedlite This unit is dedicated to the FE, but will also work with other Nikons as an ordinary flash



Versatile gun Independent makers produce guns that are fitted with different hot shoe adapters



Quick snaps Dedicated flash is very useful if you must compose pictures quickly and do not have time for flash calculations

of different cameras, as in the way that independent lenses may be made to take different mounts. The changes from one camera to another are achieved either by different interchangeable hot shoes, or by a universal hot shoe with several contacts and a switch on the unit.

Not all independent guns offer the same facilities as a maker's own guns. Some will perhaps only switch the shutter to the correct speed and not operate other functions. Some independent units may have features not found on the camera. Because of the need to allow for all the features of every maker's cameras in one gun, future dedicated multi-fit flash units may have far more features in total than some of the true dedicated units.

Flash systems

Most dedicated flash units are not part of a true 'flash system' and you cannot, for example, use a series of flash heads simultaneously in a dedicated fashion. The Olympus T32 and T20 can, however, be linked to each other and, via a central control box, to the camera. A ring flash can also be used.

The OM-2 meters only the light received on the film, in the ratio delivered by the guns, and it cuts off the flash from all guns simultaneously. With the T32 and T20 systems, unlike other auto-computer guns when used together, the exposure should be accurate.

Disadvantages of dedicated flash

Used properly in the appropriate situation, dedicated flash can reduce the risk of errors and help you get better pictures, but the degree of automation can also make you lazy. You might, for example, trust the automation so much that you forget to set other camera controls or adjust other things which need attention. The main failing is the temptation to use the system which overrides the flash when it is not charged, and to shoot haphazardly mixed ambient and flash exposures.

The other major fault is that nearly all dedicated flashguns are very low in power, intended for the family snap market and not for the serious amateur. Most offer a bounce facility, but are so weak that you would have to work at $f/2$ in a normal room with slow film to be sure of getting acceptable exposures.

When buying dedicated flash, remember to consider whether or not you may want to use the gun on another camera as a purely manually set flash, or use it off

the camera for lighting effects. You may not be able to; some models can only be switched on by inserting them into the correct dedicated shoe, and have no other switch. Some cannot be set manually, test fired on open flash, or removed from the camera (because no extension cord is made). Others do not allow you to override the X synchro speed set by the flash when you want to give a longer background exposure for special effects.

If you decide to buy a dedicated flash unit, remember that it will not guarantee perfect pictures. You can still make the wrong exposure, set the wrong film speed, forget to set the aperture or work outside the range of the flash—often only five metres.

So is dedicated flash worth while? It is inevitably a mere convenience, so the only person who can decide is the user. If you habitually fail to get good results from flash through simple setting mistakes, and have a suitable camera, then dedicated flash could be your answer.





William Klein

By approaching photography in a completely new way, Klein has been a major influence not only on the work of many photographers but also on the way in which photographic books have been presented

William Klein is one of the world's greatest exponents of 'urban photography'. His consistently original approach to his art and his willingness to experiment have made him one of the most influential photographers of the last three decades.

An American living in Paris, Klein came to photography in the early 1950s, after starting his artistic career as a painter. It was this untraditional route to photography that helped to make his own work so interesting. Within his first six years as a photographer he had produced major photographic monographs on New York, Rome, Moscow and Tokyo, whose contents did much to revolutionize attitudes towards contemporary photography.

Klein's photographic career also included a decade as a fashion photographer for *American Vogue*, after

which he gave up photography to concentrate on film making. In the late 1970s Klein returned once more to photography as a medium of expression, and despite his long absence proved that his ideas were as innovative as when he first started.

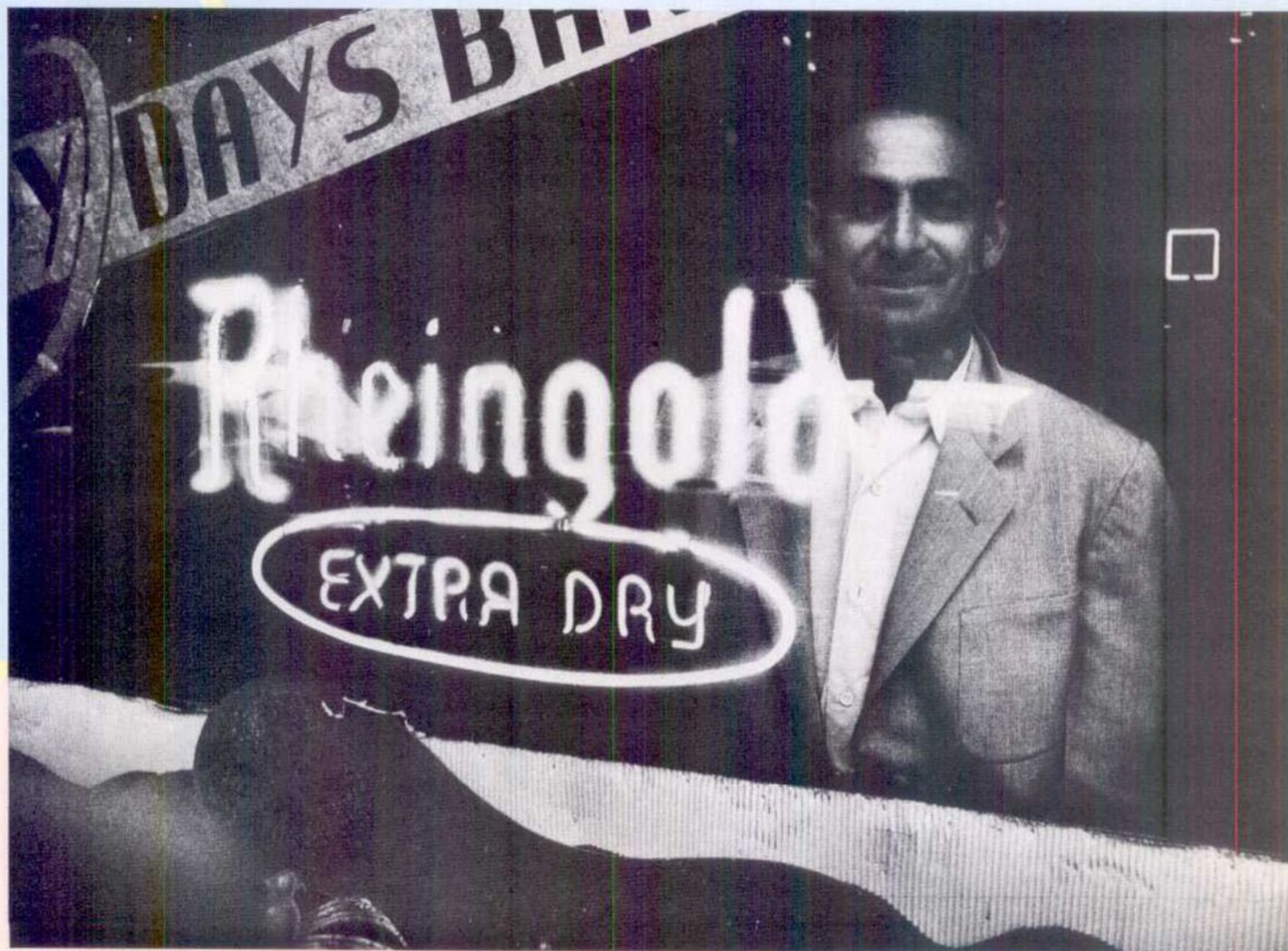
Klein's interest in photography began while he was still a painter. He became fascinated by the idea of creating abstract images in the darkroom, and decided to enlarge some of his early negatives. Like most people, he had previously taken his films to the local photo shop. Now he discovered that the pictures that had always come back smudged and out of focus were not so bad after all and started to take up photography more seriously.

As an outsider in photography with little knowledge of technique, he was free to take liberties with his images in

ways that professional photographers usually did not. 'I would look for effects that, at that time, most photographers weren't concerned with.' With his 'primitive' eye Klein experimented with quite sophisticated techniques in the darkroom, and began to apply the same ideas to his picture-taking.

When Klein picked up a camera he had no preconceptions about what it could do or how it should be used. It was a tool through which he could view the world in a new and exciting way, and his training as a painter enabled him to apply a strong graphic sense to his framing and composition.

Klein's fresh and original approach was put to brilliant use during his first return visit to his native city, New York, in 1954. The 'photographic diary' that he began then resulted in perhaps his most influential work. Its ambiguous title was



William Klein

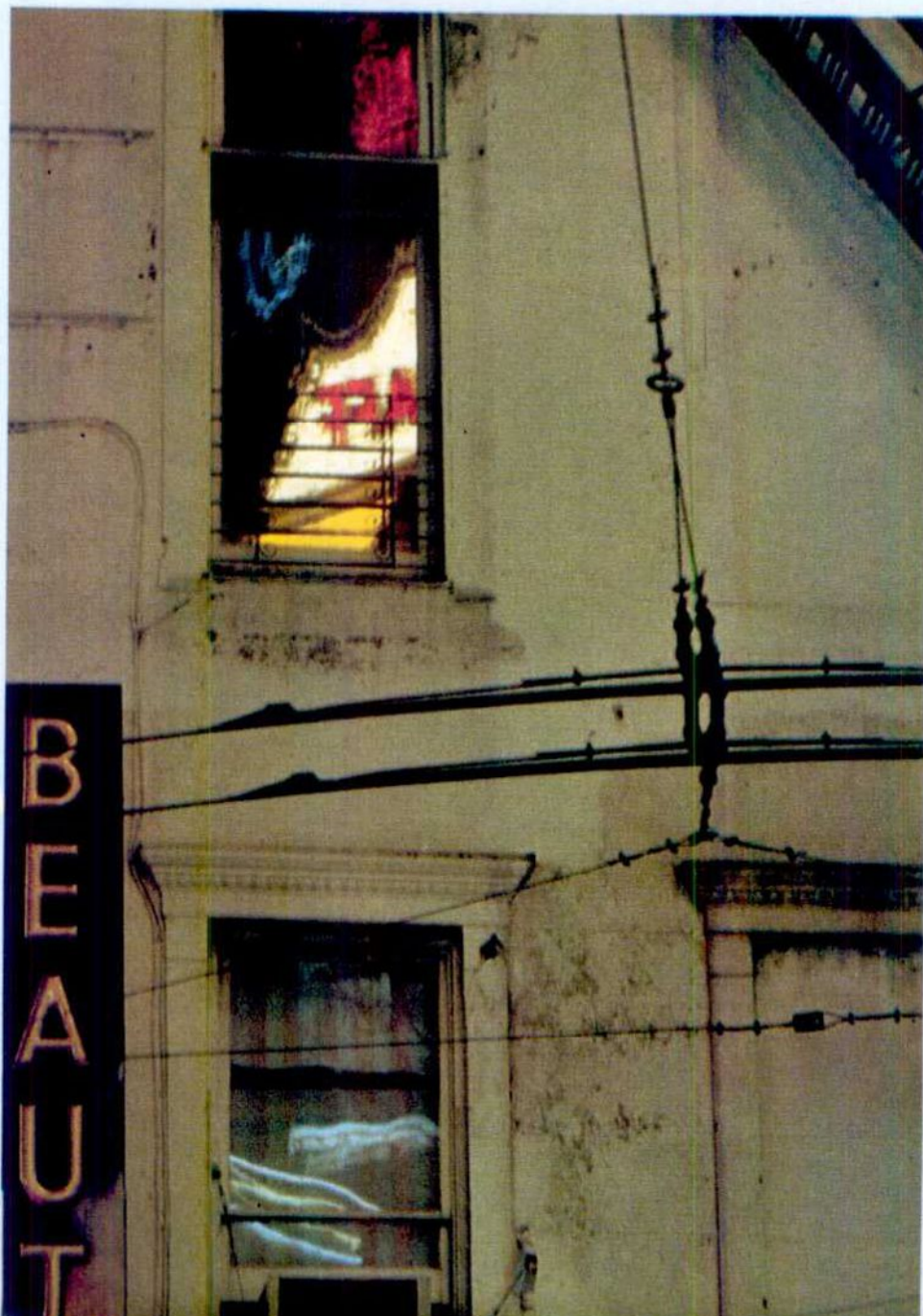


Paul Joyce

William Klein Taken in London with his favoured Leica at the ready



Puerto Rican women (above) caught as they chatter on a sidewalk in New York. The smiling face in New York framed by a bar room sign (left) and the derelict street scene next to a beauty parlour sign (below) are both characteristic of Klein's use of strong graphic elements in many of his pictures to introduce irony and a sense of the absurd. Such elements were used to great effect in his first book, 'New York'



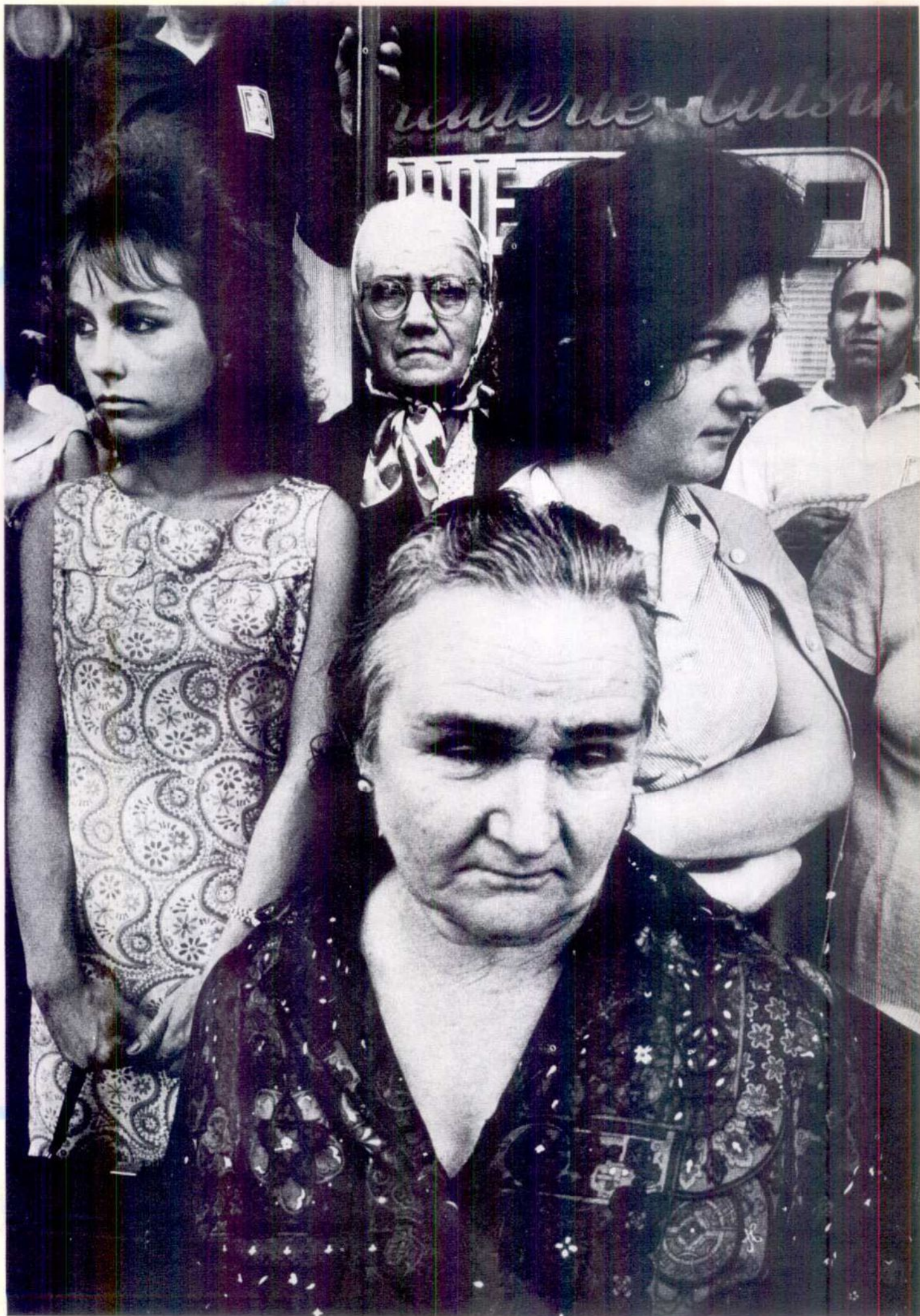
Life is Good for You and Good for You in New York—William Klein, Trance Witness Revels (New York for short). As Klein has stated, the subtitle might easily read 'Chance Witness Reveals' and this double meaning would certainly sum up Klein's approach to photography.

The impact that the publication of this book had on the photographic world was considerable. Klein's approach was enigmatic and was considerably influenced by his own intense relationship with the city. This provided the emotional charge necessary to conceive, photograph and design the book.

Klein was working at a time when the great names of photojournalism were emerging to public attention. But whereas most of these photographers were concerned with presenting unified photo essays, Klein's approach was altogether different.

'It wasn't that I wanted to create a mark as a photographer. I had something to settle with the city itself. As a kid growing up in a poor family I had felt excluded from New York... everybody there lives in the euphoric sensation of being in the midst of glamorous and heady events and actually they don't share in any of these things. People live a lot by proxy in America. Growing up there you are constantly bombarded with information about beautiful people and their activities, but if you're not participating in any

William Klein

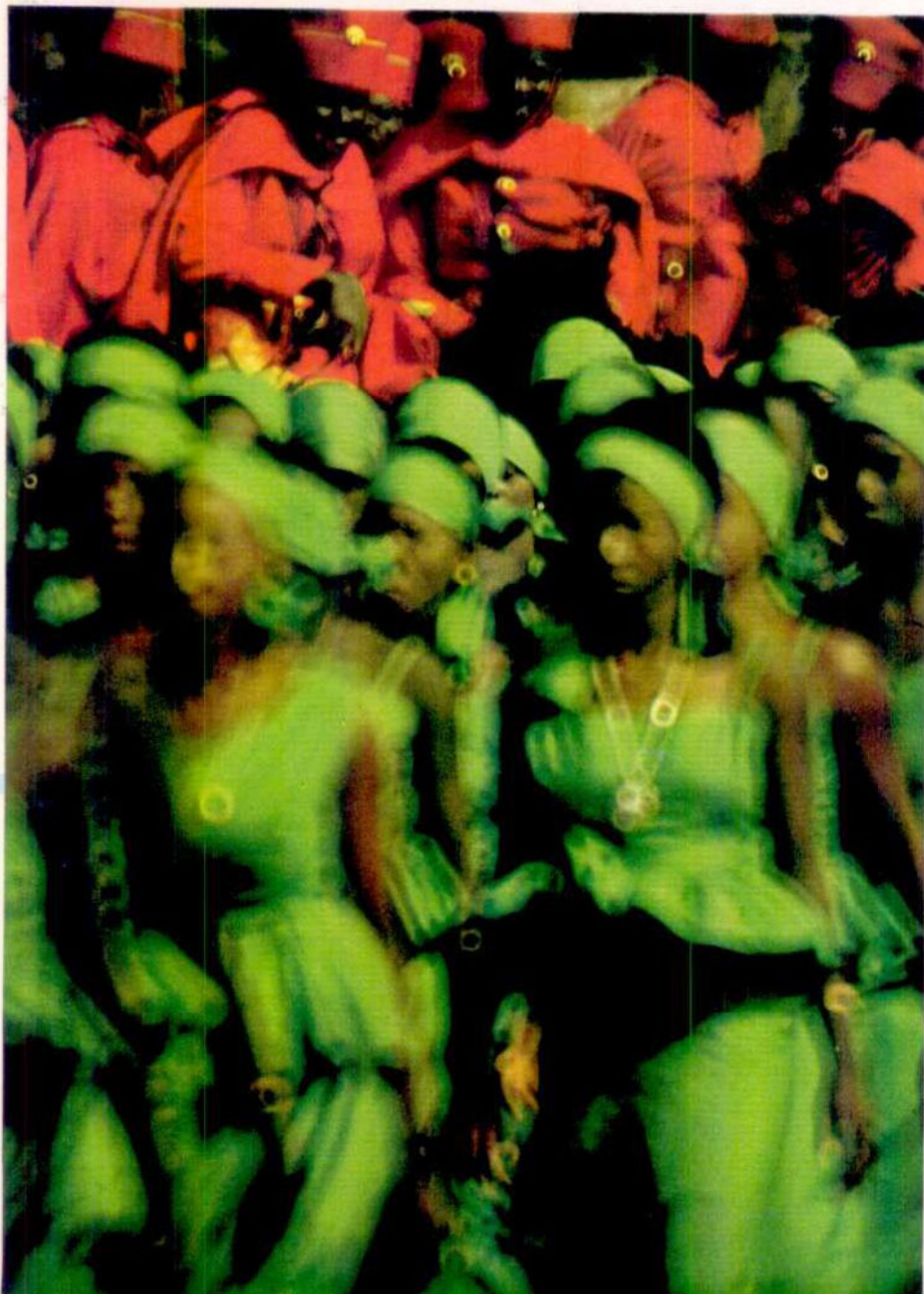
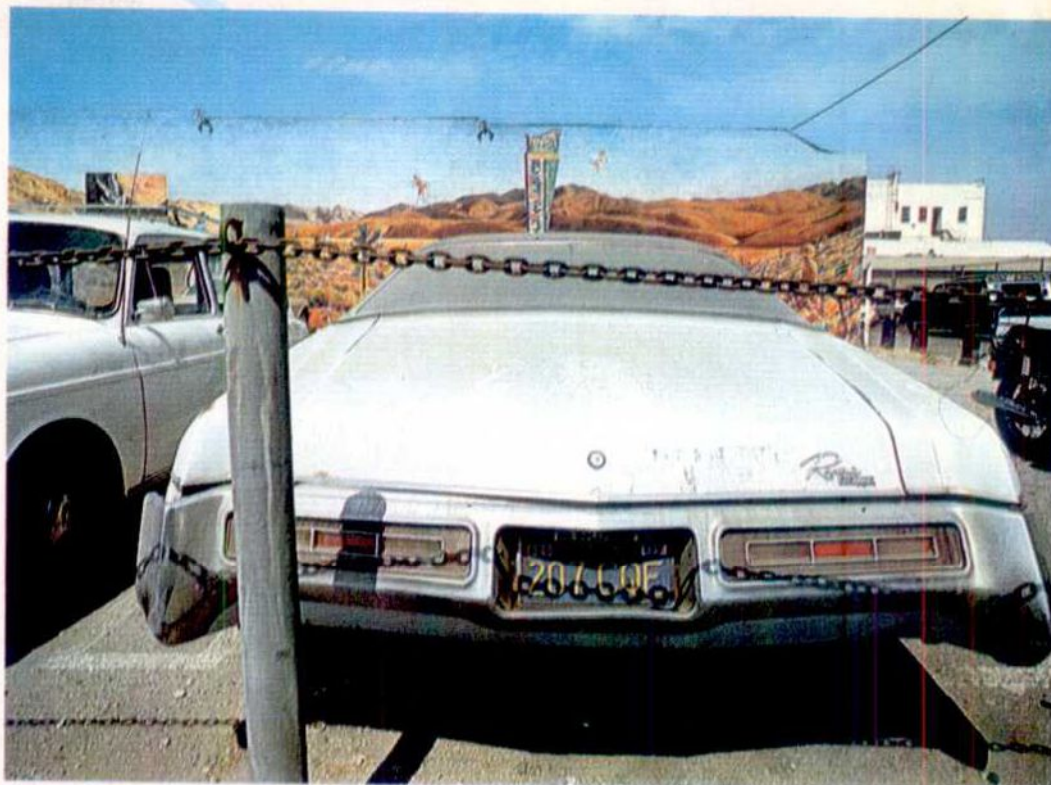


of these events you never see this great city that everybody's talking about.'

The intense personal involvement that Klein felt in New York and his gift for getting in close to a situation combined in a remarkable set of pictures. They horrified many American publishers who considered them too ugly or seedy, and it was not until Klein showed them to the film maker, Chris Marker, also an editor at a major publishing house in Paris, that they were accepted for publication.

The resulting publication of *New York* in 1955 was greeted with a mixture of extravagant praise and bitter abuse. Klein had simply ignored most photographers' preconceptions and clichés. He did not care about grain, contrast or blurring. His subjects were not caught unawares, they stared back aggressively at the lens, mirroring Klein's own approach.

Klein's images were suddenly famous. His was a completely new approach to photography. Soon, everyone was down on the streets, chasing 'real life and 'real' people, wide-angle lenses screwed firmly into place. Glaring lighting and prominent grain were now acceptable



Spectators at the funeral of Marcel Thorez, head of the French Communist Party, in Paris 1964 (left), caught unawares in a remarkable range of expressions. A forgotten car waits forlornly for its absent owner in a Los Angeles car lot (above). A more recent reflection of Klein's continuing preoccupation with the urban wilderness. Independence day parade (below) in Dakar, Senegal. Young women march through the streets in a riot of colour as horsemen look on

as an integral part of a picture. Klein's images stirred up an animosity in other more establishment photographers which it is hard to imagine now. To them, as with the American publishers, Klein's vision of New York was too real and too violent to admit.

Klein, however, had gained enough farsighted admirers to enable him to go on and produce a monograph on another city—Rome. Klein's genius as a 'street photographer' combined with his choice of a city that lived so much on the streets, resulted in another classic document.

Now established as a photographer of some repute, Klein was also starting to take on a variety of commissioned work, including some portraits and still-lives for *Vogue* magazine. Encouraged by the art director of American *Vogue* Klein also started to try a few fashion pictures. Thus began a highly productive and frequently abrasive relationship, with Klein bringing his innovative and free-wheeling eye to bear on another staid and conservative branch of photography.

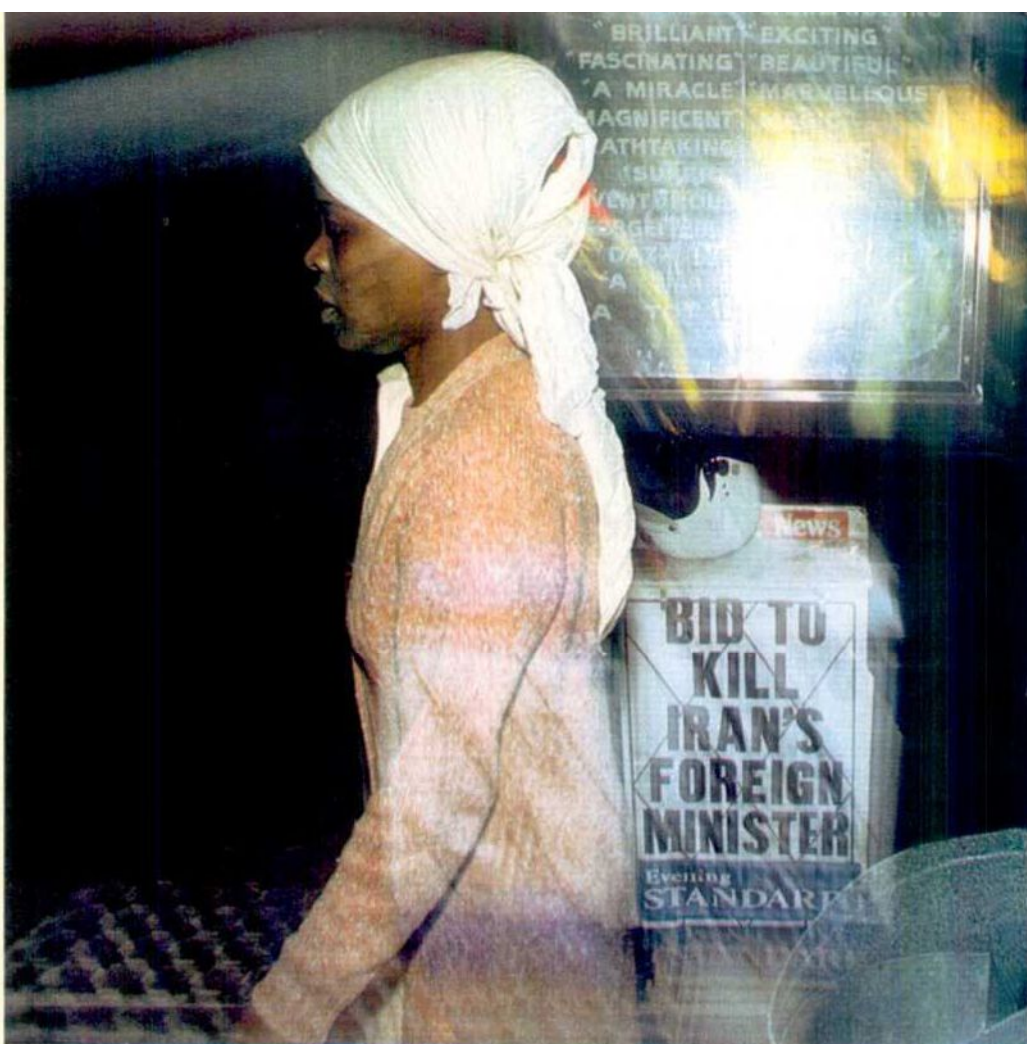
To Klein, fashion itself possessed very little interest. While the accepted masters of fashion photography, like Richard Avedon, were deeply involved with the clothes they photographed, Klein was only interested in fashion's

William Klein

The only way in which he could approach a subject so far removed from his usual concerns was to overturn all the usual criteria and explore the absurdity of the situation he found himself in. 'I couldn't see it except as slapstick... so every time I took a fashion picture there was always an element of send-up in it. I'd have a girl walking along with this beautiful great dane, but the dog would have his leg halfway up a lamppost or she'd be putting on lipstick and all the contents of her handbag would be tumbling to the ground as she walked into a door. Everything wrong or about to collapse.'

Klein also recalls a fashion assignment in Rome where he was to photograph some girls in striped miniskirts. He had the idea of setting them back and forth across a pedestrian crossing. 'I was far away up on top of The Spanish Steps and the girls were getting the full treatment from guys who couldn't understand why

William Klein/Viva





Young New Yorker (left) New York, 1955. Klein achieved this effect by pulling his enlarger in and out of focus while printing. **Soho street scene** (above) Some of his most successful pictures contain a random but significant collection of urban 'junk' and haphazard information captured together

they were crossing the road over and over again. I was photographing everything and it was very funny to see the contact sheets afterwards. A scooter went by, and the rider lost concentration and nearly crashed into a streetcar and you could see men turning around, and walking back and forth.'

However much pure fun he could inject into photographing fashion, Klein still did not forget his more serious photographic concerns and he produced two more monographs during this time - on Moscow (1960) and Tokyo (1961). Despite some initial misgivings about the problems of being able to understand a completely alien culture, Klein was attracted by the idea of visiting the land of Kyoto and Zen. He wanted to learn something about the Japanese approach to photography. Instead he found to his amazement that here was a whole generation of photographers who were obsessed by the kind of work that he had produced in his books on New York and Rome.

However, his visit did prompt him to change his technique. 'I wanted to achieve a different effect. Instead of the grainy images I had been producing I

wanted to take pictures that would be very different from the other pictures and give an industrial gloss to their surrealism. Unfortunately the publisher and his printers didn't understand this, but spent some considerable time exaggerating the grain and contrast so that it would look like my other books!'

In the early 1960s Klein's interest in still photography began to decline. He was increasingly drawn towards film making. One of the elements of fashion photography that he most appreciated was that he learned how to handle actors and assistants in complex situations and using complicated lighting systems. Earlier in 1960 Klein collaborated in the making of Louis Malle's zany comedy 'Zazie dans le Metro', and he also began to make his own films in the early 1960s.

Then in 1963, just two years after an international jury had voted him one of the 30 most important photographers in the history of photography, he contracted out of photography and began to devote himself fulltime to film making.

'I gravitated towards movies because there's more of a dialogue with the public. As a photographer you can publish books but you don't get that much feedback. After a while you begin to feel that it's something of a dead end! In the next 15 years Klein made award-winning film profiles of Muhammad Ali, Eldridge Cleaver and Little Richard, as well as three major feature films and many major documentaries.

Then in the late 1970s he returned once more to still photography which had undergone a great resurgence of interest amongst the general public. In some ways he now regrets having been absent from photography for so long, but he also sees that now there are many more possibilities. 'I am taking pictures again because I like photography but also I can do more with these pictures than before. I'm also amused by the challenge of dealing with photographic ideas after all that's happened since I stopped in the 1960s.'

Klein still enjoys working in black and white, but since his return to photography he works increasingly in colour. He continues to use the Leica M rangefinder cameras as he likes the wide-angle 21mm or 28mm viewfinders on top of the camera. 'I think they are much closer to the vision of your eye and the image is clearer. You can really see what's happening even with ten or fifteen people in the frame.' He also uses the Leica R reflex camera, which although not as quiet as the Leica M, works better with long focus lenses.

Above all, Klein has been influenced by the increased dialogue that is now taking place between the photographer and his audience. Although still wary of the photographic art establishment Klein is also encouraged by the great interest shown in his photography by a much younger generation of photographers who are closer to the kind of ideas which he has always tried to express.

Klein's photographic re-emergence is

marked by greater concentration on colour work. He is also more involved in the presentation of his work, and likes to explore new and unconventional ways of presenting his photographs in galleries. He has, for example, a slide show of some 600 pictures which cover all his preoccupations and photographic explorations. 'There's every kind of picture—black and white, abstract, reportage, places, people, fashion, colour. Recent assignments on London's Soho, industrial areas in central France, beach scenes, Parisian streets and street life. The lot.'

Demand for Klein's early pictures—the ones he describes as 'Photos I wanted to take'—is now such that collectors will pay more for them than he was paid per page on his fashion assignments. Further irony for someone who turned his back on a career in fine art in the belief that dealers and galleries were no longer viable, and that photography was the thing to concentrate on as anyone could afford to buy a couple of prints.

It seems strange, considering that he has spent the majority of his creative life in Paris, that he has not published more photographs from his own doorstep. 'I've always been prompted to take photographs on occasions when I was really excited by something, on a trip when the job had to be done. If you're doing a book on Moscow you better do it now, because you can't do a retake next week. In Paris I never had that feeling of a scene escaping you, although it was of course, just as fast.'

Klein's return to photography places him once more in a context in which he has already produced some extraordinary work in the past and bodes well for the future. For his preoccupations as a photographer are those of urban man himself: alienation, loneliness, fear and disassociation. Klein prowls around his concrete jungles, firing fast from the hip. Subjects back away or loom close, scowling in their interruption, frequently annoyed and aggressive. But any careful reading of the images will show a sensibility at work beneath the harsh surface reality.

His crowded frames reveal characters who are both sad and appealing, trapped by Klein's lightning reflex and doomed to share their fears with us for ever. In the 50s he stamped his personality on the city of New York with such force and authority that it is difficult to conjure an image which does not in some way relate to Klein's vision. He pioneered the use of a wide angle lens as a photographer's standard equipment. He proved that if there was enough light to avoid tripping over your own feet there was enough light to shoot. He showed how it was possible to use characteristics of the photographic medium such as grain and lens flare and distortion to the subject's advantage. Finally, and most importantly, he opened the door and let in a gale of fresh air which blew years of cobwebs from the photographic establishment. His latest work show that this energy and exhilaration remains undiminished.

Lens faults

No lens is perfect. Even complex lenses can suffer from a variety of faults which affect the image in different ways

Modern camera lenses give remarkably high quality results; yet even the best lens cannot give an image that is completely sharp—every lens suffers from a number of defects known as aberrations, and these result in less than perfect focus.

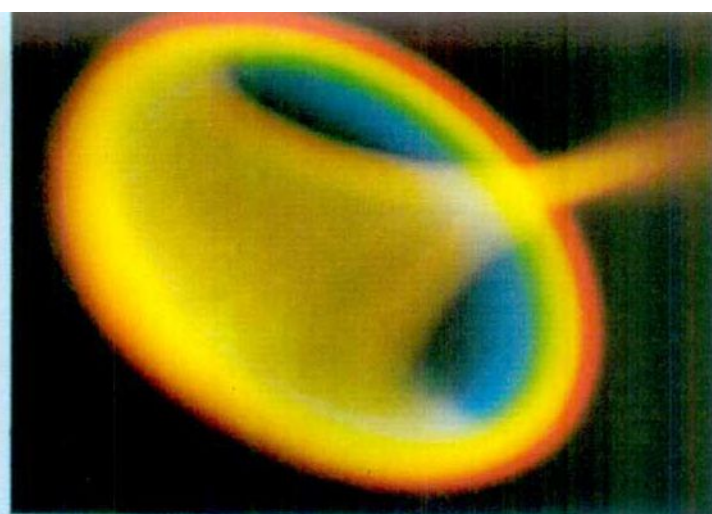
Lens aberrations take a number of different forms, but their effects are often indistinguishable. Ideally, all the light from any point in the subject would be focused by the lens on a corresponding point on the film. Unfortunately, lens aberrations mean that not all the light is focused at quite the same point and so the image is slightly blurred. Some types of aberrations affect the entire picture, even the very centre, along the axis of the lens. This type of

aberration is referred to as direct or axial. Others do not affect the centre of the image at all but grow steadily worse towards the edges—this is oblique or off-axis aberration. With careful lens design involving multi-element lenses, these aberrations can be reduced to a minimum but there are always some residual effects.

Lens shape

Photographic lenses depend upon their shape to work properly. They work by refracting (bending) light rays so that all light from a particular direction—from a particular point in the scene—is brought to focus on the film.

Unfortunately, the lens shape that would produce minimum aberration is not the



Point of light Both coma and chromatic aberration affect this image

easiest to manufacture and the majority of photographic lenses have spherical surfaces—that is, the surface of each side of the lens is shaped like part of a sphere. Surfaces this shape are easy to grind, but it gives various types of aberration.

In particular it gives a form of direct aberration, spherical aberration, affecting the whole image. With a spherical lens surface, light rays refracted by different parts of the lens come to focus at slightly different distances. Thus, light rays passing through the outer regions of the lens are focused closer to the lens than those passing through the centre. The result is a generally soft focus over the whole picture, particularly with close-ups.

While some portrait lenses exploit controlled spherical aberration to give special soft focus effects, it is usually undesirable. The simplest way to reduce spherical aberration is to stop down the aperture so that only the central portion of the lens is used. Of course, since light refracted by the centre of the lens focuses slightly further back than that refracted by the edge, stopping down has the effect of shifting the focus a little further away from the lens. While the focus shift may be negligible for most shots, the lens must always be refocused after stopping down for very close shots with a camera or for quality work in the darkroom.

Unfortunately, it is not always possible to stop down sufficiently far to reduce spherical aberration and alternatives must be included in the lens design. One approach is to use a weak diverging (concave) lens element in conjunction with the main element. The diverging lens also produces spherical aberration but in exactly the

opposite direction to that produced by the main lens and so, used in conjunction, they cancel each other out.

Close-up lenses often use a floating element which moves along the axis of the lens according to the focusing distance. An expensive alternative is to avoid a spherical surface altogether and produce a specially shaped aspheric lens element.

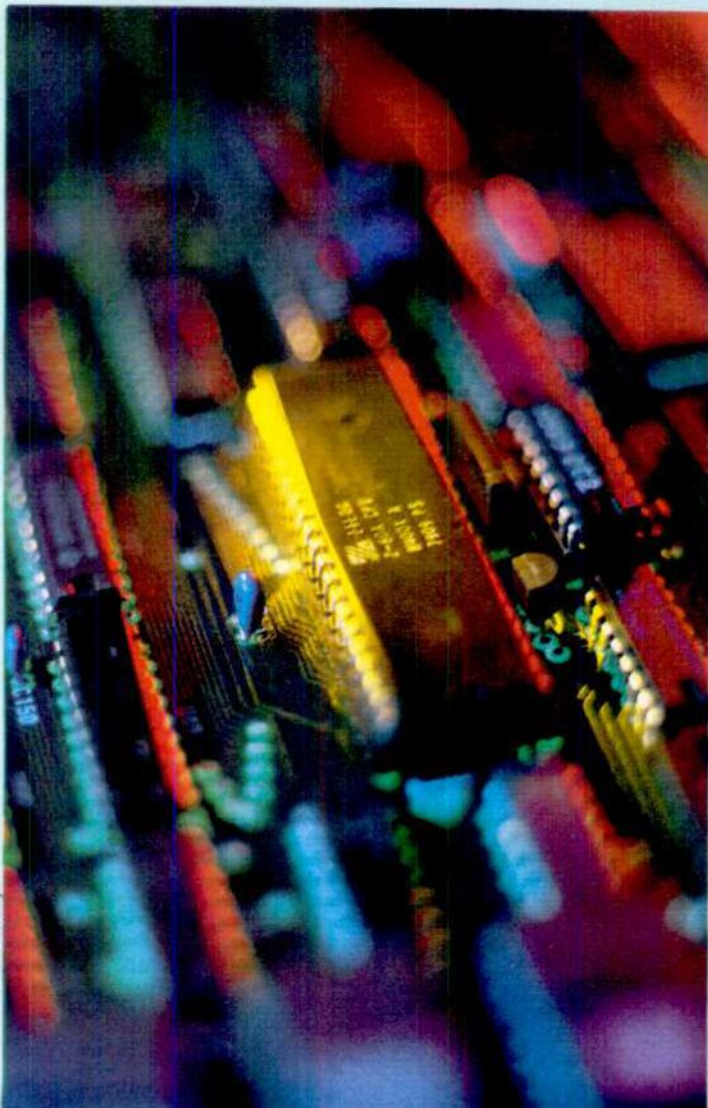
The spherical lens shape also produces aberrations to light rays falling obliquely on the lens surface and the image of a point is fanned out around the point like the tail of a comet—this aberration is therefore known as coma. Like direct spherical aberration, coma can be reduced by stopping down and adding mutually correcting elements to the lens.

There are two other significant types of oblique aberration: distortion and astigmatism. Distortion occurs because the aperture stop prevents oblique light passing through the centre of the lens. This means that magnification of the image varies from centre to edge. The image of a rectangular subject either bows in, to give pin-cushion distortion, or out, to give barrel distortion.

This form of distortion occurs whenever the lens elements are not arranged symmetrically around the aperture stop, unless the stop is very carefully located. Stopping down has no effect on distortion, as the problem is image shape and not sharpness.

Telephoto lenses tend to suffer from distortion as they are usually very asymmetrical. A zoom lens can vary from one type of distortion to the other as the focal length is

Sharp centre Only the centre of the picture is sharp due to shallow depth of field and slight field curvature



changed. A symmetrical design, such as the rapid rectilinear, avoids distortion. It does this by combining a front lens group, which has pincushion distortion, with a rear group which has barrel distortion.

When a lens suffers from astigmatism it is impossible to focus a point in the scene into anything but one of two straight lines at right angles to each other. This is because rays of light converging vertically come to focus a different distance from the lens to rays converging horizontally. So when vertical rays of light are focused, horizontal rays are still a little spread out—or have spread out again beyond their focus—and this spread of horizontal rays registers as a horizontal straight line. If, on the other hand, the lens is focused at the point where horizontal rays converge, the vertical rays are spread out and register as a vertical straight line. The best compromise is to focus midway between the vertical and horizontal foci so that a point in the scene registers as a small circular patch—the perfect 'point' image is unattainable.

One other important aberration is caused by the fact that a curved lens is used to project an image on to a flat film surface. The image of a flat subject, formed by a simple lens, is saucer shaped. This effect is known as *Petzval curvature*. If no correction were made, the centre of the image would be sharp, while the outer edges would be out of focus—or vice versa. Correction is made by using a mixture of negative and positive elements to force this natural curvature into a flat surface, or flat field, much more suited to a film gate.

All aberrations caused by the shape of the lens can occur with light of a single colour and wavelength but normal 'white' light consists of many different colours and wavelengths, and the different ways in which different colours of lights are refracted produces another range of aberrations.

Chromatic aberration

When white light passes through a simple lens, short blue wavelengths are refracted slightly more than long red wavelengths and the

light is dispersed into a spectrum (see page 271). This produces chromatic or colour aberration.

Axial chromatic aberration occurs because blue light comes to focus nearer to the lens than red light—green light is focused midway between. The lens, therefore, has a different focal length for each colour and it is impossible to focus one without the others being out of focus and giving colour fringes.

The aberration can be reduced by stopping down to give a greater depth of field, but the best correction is made by combining the main lens with a diverging element which cancels the effect. This diverging element must be made from a different type of glass, so that the aberration is corrected but the combination remains convergent. Unfortunately, a different element is needed to correct for each colour of light.

An achromatic lens has two types of glass and is corrected so that green and blue—two colours—usually focus at the same point, with the other colours slightly out. An apochromatic lens includes at least three different glasses and is corrected for three wavelengths—red, green and blue. With both these lenses, a separate focusing index is needed for infrared, though a superachromat is corrected for this as well.

Even if axial chromatic aberration is corrected by using mutually cancelling lens elements, the different focal length for each colour may still cause transverse chromatic aberration of light falling obliquely on the lens. Because each colour has a different focal length, the size of the image projected by each colour is slightly different. In a lens suffering from transverse chromatic aberration the red part of the image of a white subject is therefore slightly larger than the blue image. The effect is to produce more and more pronounced colour fringes towards the edge of the picture area.

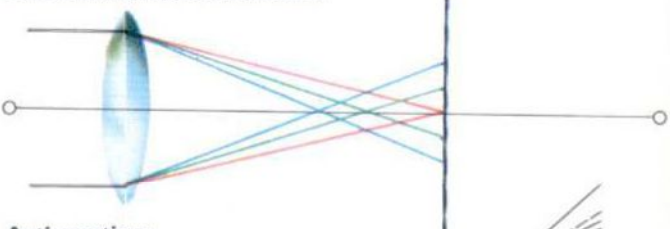
Transverse chromatic aberration can often be very obvious and it sets a limit to the performance of long focus lenses although low dispersion (ED) glass or fluorite elements can significantly reduce its effects.

Types of aberration

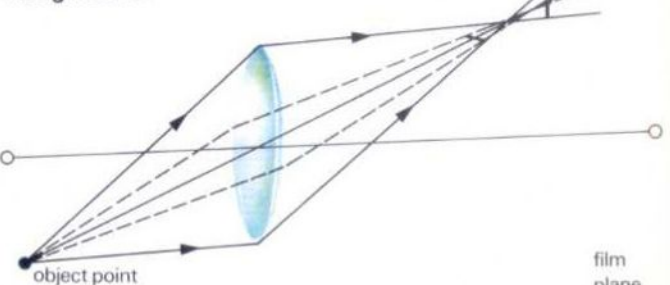
Axial chromatic aberration



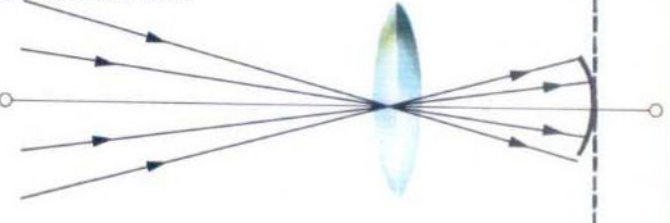
Lateral chromatic aberration



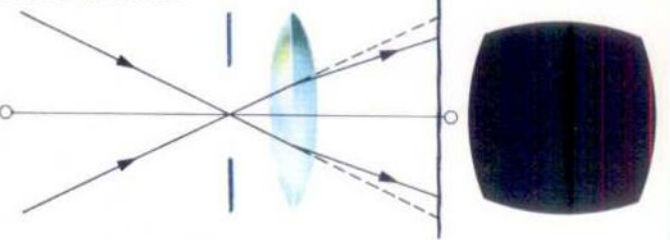
Astigmatism



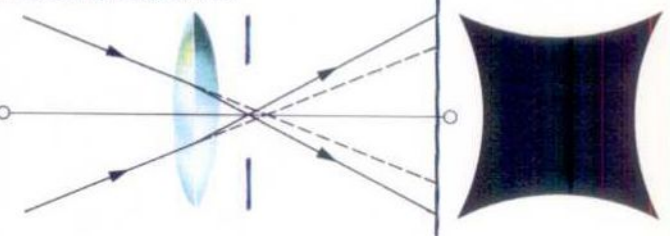
Curvature of field



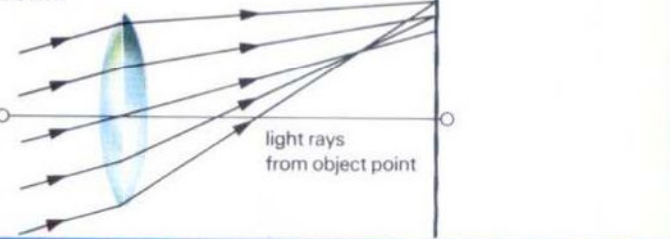
Barrel distortion



Pincushion distortion



Coma





Creative approach

Wildlife

It is more exciting and rewarding to photograph wildlife in its natural setting than in captivity, but locating your subjects and getting close enough to shoot requires some thought and practice

You only have to glance at some of the glossy coffee table books in the bookshops to appreciate the huge popularity of wildlife photography. Yet there are surprisingly few really good pictures of animals. There are many fascinating shots—fascinating because they show some rare and exotic creature or because they reveal something about the animal's way of life—but few make memorable pictures in their own right. Wildlife photography, therefore, presents the photographer with a special challenge.

The reason for this dearth is obvious—by definition 'wild' life is awkward, uncooperative, and evasive. Many photographers feel it is quite an achievement simply to photograph a particular crea-

ture and wish to go no further. Naturalists, for instance, often want no more than record shots. But with a little thought and a good eye, successful 'creative' wildlife photographs can be taken.

Of course, the plains of East Africa provide the most spectacular wildlife, but you do not need to go out on safari to take good pictures of animals in the wild. The countryside everywhere offers opportunities. Even cities often have some forms of wildlife—birds, for instance, live close to the heart of the largest cities. The local wildlife might not seem very impressive, but it can be quite photogenic.

Most wildlife is quite accessible to the

photographer. It does not require special equipment, although a telephoto lens is useful when photographing those animals which you cannot approach closely.

Animals are wary of humans, with reason, since many species have been hunted to extinction. It is worth understanding a common feature of animal behaviour whereby animals create an imaginary safety perimeter around themselves within which intruders must not come. Thus a particular bird will take little notice of you at 40 metres, but at 30 metres it may take off and fly a little

Hans Reinhard/Zefa

Flying leap *Taking a low viewpoint helps make a stone marten's playful jump look spectacular*





Mole These animals are not seen very often in daylight, but with a lot of patience, you may surprise one.

Koala A long lens is essential when photographing shy animals. Here, the photographer climbed a nearby tree for a better viewpoint. **Flamingos** A slow shutter speed lends an impression of movement as birds take off



Leimbach/Robert Harding Associates

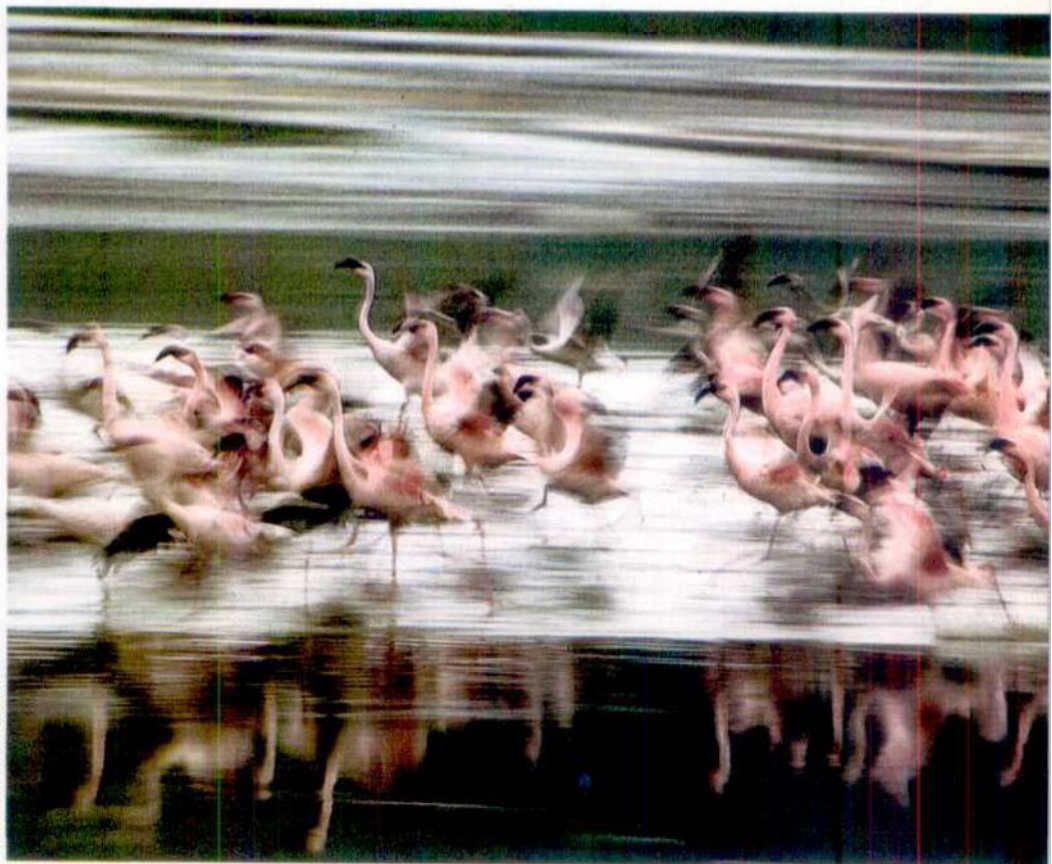
further off to re-establish the distance. You may need to approach the animal unobserved by stalking it carefully, or by using a hide, or setting up a remote control device.

You will have to decide on the type of wildlife subject you intend to photograph. Large mammals are unusual in many Western countries—the European bison, for example, can only be found in a single national park in Poland, although it was once common over much of northern Europe. Bears, wolves and wild boar, too, are unlikely to be encountered outside large national parks. Deer are much more common and are found in many countries. Some parks even have herds of deer and you can practise stalking these shy creatures without having to trek long distances over open country. In the rutting season you may get some exciting images when the bucks fight. Do not go too close, however, as stags can be dangerous. Birds form another category entirely, for they are to be found almost everywhere. From small and common garden birds to giant eagles and vultures, this is a subject area of almost inexhaustible possibilities. Smaller mammals and reptiles are also common, but often difficult to find without special knowledge of their habits. Frequently they rely on speed to escape, or remain totally hidden in undergrowth, making them difficult to photograph. But with the right approach, some species such as squirrels are quite accessible.

Some creatures—like the pigeons in the park—are very easy to find and photograph. Most, however, are much more elusive and it is important to read about the creature you want to photograph so that you know the type of place to look. Foxes, for instance, generally build their homes underneath the roots of a large tree in relatively dry, sandy soil. But to locate the right tree, you must usually be able to identify and trace their

droppings and follow other distinctive signs. Often the best policy is to ask a local naturalist or someone who knows the area intimately.

Again, once you have located the creatures, you must make sure you know enough about their habits in order to decide the best times and the best places to photograph them. This actually requires a great deal of patient research. The best light, for instance, will not necessarily coincide with the creature's most active time. Rabbits, for instance, are generally most active around dusk, but their eating ground may be in deep



Hans Reinhard/Zefa



Alan Weaving/Ardea Photographics



On the alert Try to capture animals when they make a characteristic action, like these standing suricates. **Necking** Take the chance to photograph animals and birds during a mating display while they are preoccupied

shadow at this time of day. While it may be possible to get a picture in these lighting conditions, you may have to return on many occasions at less favourable times to achieve a good shot. Patience is one of the most important qualities for the wildlife photographer.

Often, however, shots are totally unplanned and depend on the rapid reflexes and quick observation of the photographer. You must be constantly alert to catch the moment the bird flies off its perch or the deer lifts its head and bellows.

Quite often the feature that distinguishes a good wildlife photograph from a technically perfect but visually indifferent shot is the fact that the creature is doing something. It is worth spending some time and effort to achieve this kind of shot. A bird in flight, for instance, is far more impressive than a bird sitting still on a perch. It is not simply the fact that the bird is frozen in motion, capturing a moment the eye is rarely able to appreciate, that helps to make it a more interesting picture. It is also the fact that the wings are outstretched to reveal all the colour and texture of the feathers. Even if the bird is sitting on its perch, it is often worth waiting for it to stretch its wings.

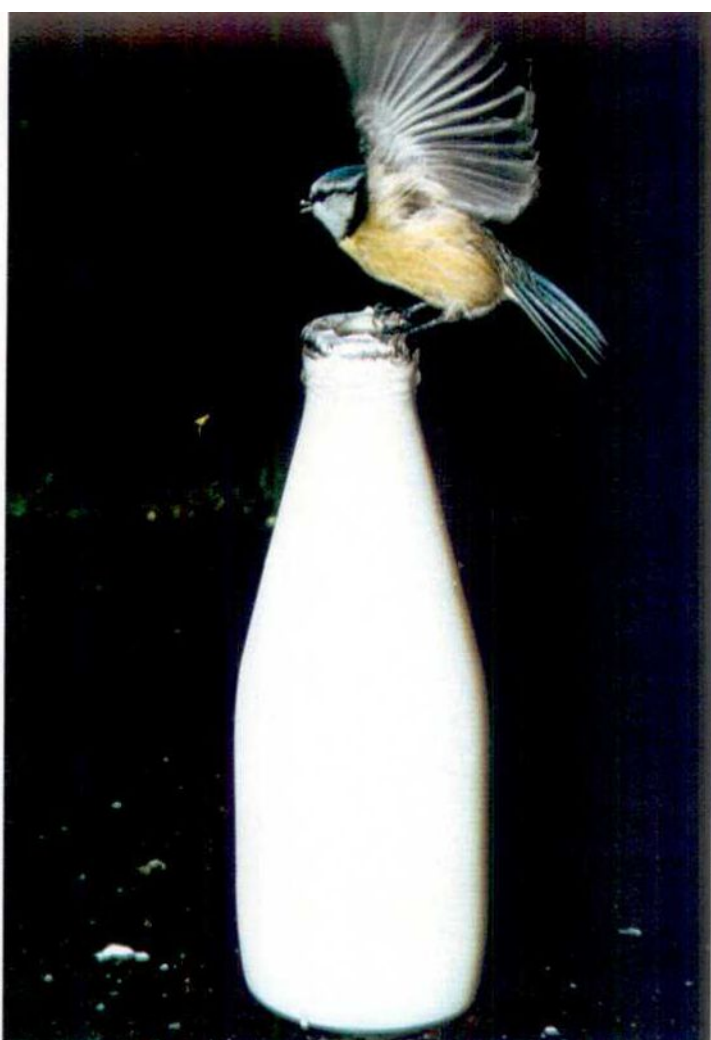
Surprisingly, though, many pictures of



Pat Morris/Ardea Photographics



S Meyers/Vision International



Brian Hawks/Robert Harding Associates



Walter Rohdich/Frank Lane

Hare fighting Some animal displays are rarely seen but make superb shots. A telephoto is essential. **Blue tit** It is worth losing a little milk to catch such a picture. Frame closely to exclude distractions but do not exclude essential detail. **Frog** Electronic flash is one of the only ways to capture a very fast movement such as this

birds in flight are less successful than the photographer anticipated. Although this is often because the birds are too small in the frame, it is more usually because the photographer has failed to wait for the right moment. Side on, for instance, most birds can look rather ordinary, even in flight. To get the best shot, you must wait until the bird flies towards you so that you can see the full wingspan. Obviously the choice of shutter speed is crucial. For the sharpness that reveals all the texture and detail of the feathers, you need a fast shutter speed to freeze movement. But you can often catch the grace of a flock of large, slow-moving birds such as geese by photographing the birds flying past using a slow shutter speed. The wings are blurred and if the background is thrown out of focus, the whole picture takes on a beautiful dreamy quality. Although it is not obvious why, this type of shot seems to work best with the birds flying horizontally across the frame with their wings caught at the bottom of the downstroke.

Catching the right moment of action is also valuable with other creatures. Once you have arrived on the scene, or

spotted the creature coming into view, it is worth taking a few record shots and then waiting for a while until something interesting starts to happen. You may be lucky enough to catch an otter with a fish, or a bird of prey swooping on a mouse. These dramatic moments, though, are rare and many professional wildlife photographers may have to wait months or even years for the opportunity. More usually, the type of action that you can wait for is far more subdued—things like a rabbit scratching behind its ear with its hind leg, or a large yawn.

If there is no action whatsoever, or you wish to make a straight portrait of an animal, look for lighting conditions and a pose that reveals something of its character and beauty. Small furry tree climbing animals, for instance, often look most appealing clasped around the trunk of a thin tree providing they are looking directly towards the camera—without their eyes the shot loses some of its effect. Eyes are important in most posed animal shots and they should generally be the focus of attention.

With other animals, it may be the texture of the fur that is the most striking quality. This may be best revealed by soft backlighting or low angle side-lighting. The quality of the light should be chosen, if possible, to match the subject.

Even if the pose or the action are right, however, photographs of animals are often marred by a poor location—a dull foreground or a distracting background. This may be beyond the photographer's control—you cannot choose where the creature decides to live. Many creatures, of course, have natural camouflage and this makes it impossible to separate them visually from their surroundings. The only solution may be to selectively focus on the animal using a wide aperture to minimize depth of field. This is probably the best approach with any distracting background. Unfortunately, it may be difficult to keep a moving animal in focus.

Sometimes, however, the background may be too uninteresting—this is frequently the case with shots of herds of deer in the park or horses on the plain. It is worth looking for a tree to frame the foreground.

Of course, the wildlife need not necessarily be the centre of attention. Many attractive wildlife photographs only use animals to liven up the image—shots of birds flying across a sunset, for instance, are very evocative. But whatever approach you take, there is something very satisfying in making a record of glimpses into the lives of animals.

Otter It is best to photograph from a hide if you want to catch the moment when the otter catches a fish. **Fox** A long telephoto and lots of patience are essential for shots like this emerging fox. **Blue goose** The photographer has taken care to adopt a viewpoint which does not allow the horizon to cut across the bird in flight. **Fallow deer** The dappled light of the forest is an excellent setting for the camouflaged fallow deer

Hans Reinhard Zela



R. Maier/Vision International



Jen & Des Bartlett/Bruce Coleman Ltd.



H Gritscher/Aspect Picture Library

First steps with lith

If you are familiar with making prints on ordinary bromide paper, printing on lith should present no problems. Not only is it relatively simple but its effects can give your pictures a completely new look



Some of the most creative darkroom effects, in both black and white and colour, are achieved by using lith film. The material is basically a high contrast emulsion which, when developed in special lith developer, gives results of the highest possible contrast—pure black and white, with no intermediate tones.

By controlling the exposure, it is possible to vary the tone at which black changes to white. This makes it possible to produce a wide variety of different copies from a single original, each showing different effects. And by printing the results in different tones or colours, any original can be transformed.

Lith film is also invaluable for producing special effects, and for copying *line* originals—that is, subjects with no tones in the original, such as print or line drawings. The high contrast makes sure that the edges of the lettering stay sharp, and avoids the risk of grey backgrounds on the copies. The material is therefore useful for anyone who is regularly called upon to make prints of text, such as producing the labellings or headings for exhibitions. The material often called line film—high contrast sheet film—should not be confused with true lith film, which has a thinner emulsion.

The word lith comes from the film's original use—as a negative material for making the lithographic plates used in printing. (It stems from the Greek word *lithos*, meaning 'stone'—from the stone plates originally used for printing.)

While lith film itself is a high contrast material, and will give a contrast of about 3 in ordinary developer (compared with a contrast of about 1.5 of conventional camera films), it is intended for use with lith developer. This produces the phenomenon of infectious development. To start with, a faint image appears. The most heavily exposed parts of this image then act as development centres—a dense black speck appears and rapidly grows in size. Thus the heavily exposed areas appear dense black, while the less heavily exposed areas are virtually clear. As development proceeds, the densest areas grow in size, rather than getting blacker, and new development centres appear.

Lith film is available in two forms—orthochromatic and panchromatic.

Nude Shots with a wide range of tones make suitable subjects for lith prints. This nude shows characteristic rough edges between areas of dark and light

Orthochromatic film is insensitive to red light and can be handled under a red safelight. It is therefore ideal for black and white darkroom use—though for colour work it may give poor results. Panchromatic film must be handled in total darkness, as it is sensitive to all colours. It is preferable to orthochromatic material where you are using colour negatives or slides as your originals.

The material is not suitable for use in the camera, though it is available in 35 mm form to order for special purposes. The most common format is sheet film, and it is available in a range of different sizes. It is not normally stocked by most dealers, but is usually available to order or by mail from special suppliers. The cost is comparatively high—about the same price as a couple of boxes of colour paper—but it may be possible to cut costs by sharing a box of the material with others, or by using it in a small format. This, however, tends to compromise the quality for many purposes, and ideally lith film should be used as a contact material the same size as the final print.

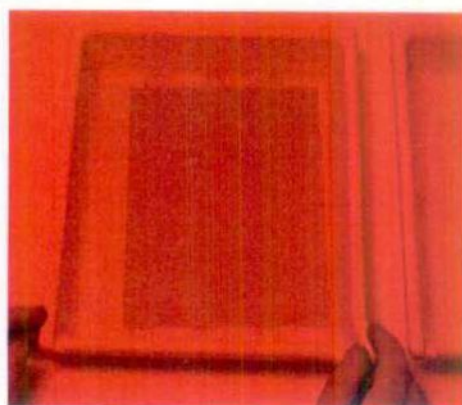
As an alternative, where economy of material is important to you, make the lith film positive either by contact or by projection to the largest size of film that your enlarger will accept. For example, you may make 6 x 6 cm positive and negative lith copies by enlargement from a 35 mm negative, if your enlarger will allow you to print 6 x 6 cm negatives. A disadvantage of this is that the more advanced printing techniques, with several images printed in register, will be much more difficult to achieve.

Not all negatives are suitable for lith printing. In general, those with distinctive areas of dark and light are preferable. Shots showing clearly defined detail, patterns, silhouettes and abstract shapes are ideal. However, originals where the subject has similar tonal values to the background—a Dalmatian dog in dappled sunlight, for example—may prove difficult. Portraits can be effective on lith film, but bear in mind that wrinkles are emphasized by the high contrast, which may be unflattering.

Making a test print



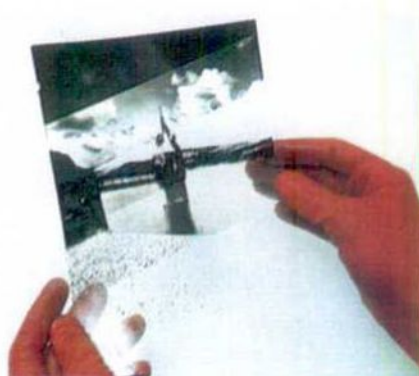
1 When you have lined up and focused the image, expose the lith sheet in steps using a black card mask in the same way as for a paper print



2 Slide the sheet into the developing dish, emulsion side up, rocking it slowly. At first, no image will appear on the film



3 Once the image appears, it becomes denser very rapidly. Wash the film, then fix it for at least twice the time it takes to become transparent



4 When the film is dry, examine it by daylight or a good artificial light. You can now choose which exposure most suits the effect you want to achieve

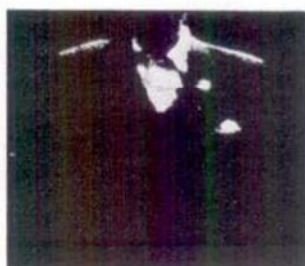
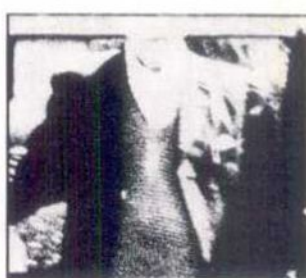
Processing lith film

Sheets of lith film are processed in dishes in the same way as paper. It is advisable to use a developing dish only slightly larger than the film size, as developer is expensive. Develop the sheets one at a time, as they scratch very easily.

Lith developer is essential for infec-

tious development. Like lith film, it is not on most dealers' shelves, and you may find that you have to order large quantities at a time. Again, it is worth sharing a supply with others. Ask at your photographic club, or at an evening class, to see if there is anyone interested in sharing the expense with you.

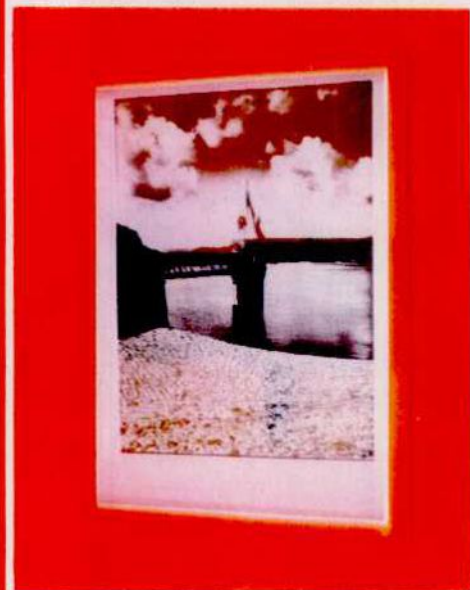
All lith developers are caustic and



Infectious development

As development time increases, blacks seem to grow, without becoming denser. These sheets were given the same exposure, but only the above had 'standard' development time. The original bromide print is shown far left

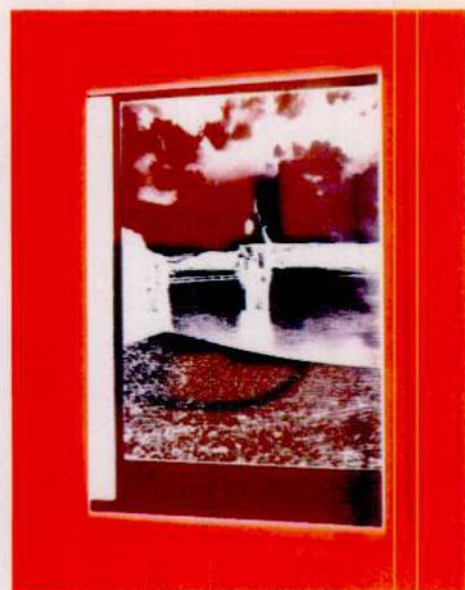
Contact printing



1 To make the contact print from the interpositive, sandwich the two lith sheets, emulsion to emulsion, under a glass sheet and expose as planned



2 Process the internegative as shown, and examine it under a good light. This internegative was given standard exposure and normal development



3 Sandwich your negative, emulsion side down, with a sheet of bromide paper, under a glass sheet. Make sure that you keep your exposure consistent

should be used with care. To avoid dermatitis, wear rubber gloves if there is a risk of your hands coming into contact with the solution.

The developer is mixed in two parts, A and B. The working solution, consisting of equal parts of A and B, has a very short useful life, so mix only what you need immediately before use. The developer oxidizes very quickly once mixed, and you should not keep it for more than 10 minutes. Throw the solution away as soon as it begins to look yellow. It is cheaper to do this than to risk spoiling your pictures, so to achieve consistency between your test exposures and the final results, use fresh developer for each.

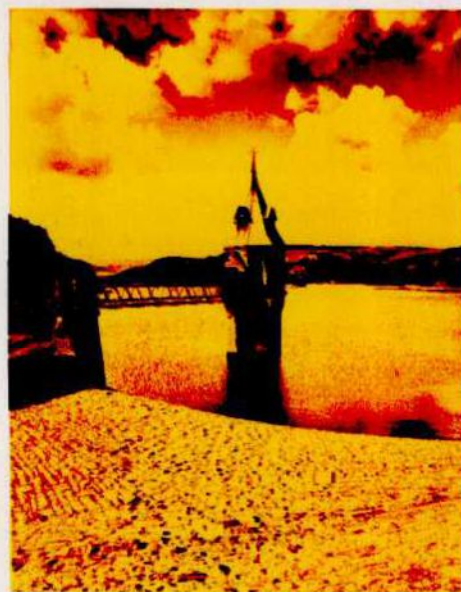
When you have exposed the film, slide the sheet into the developing dish emulsion side up and rock it gently to make sure it is fully covered by the developer. A typical development time is 2½ minutes at 20°C.

During processing, you will find that the image looks blacker than it actually is, so always develop for the recommended time and examine the results by white light after fixing.

Some photographers give continuous agitation of the dish for the first two minutes of the process only, then leave the dish stationary for the rest of the time. This tends to give sharper edges to the black areas.

A stop bath is the best way to halt the development and avoid dichroic fog—a lightly coloured fog which may appear as a result of misprocessing. If you have no stop bath, washing the film in running water for 10 seconds is satisfactory.

You should then fix the film in fixer with acid hardener for at least twice the time it takes to clear—usually a minute or



Landscape You can use filtration to contact print lith negatives on colour paper for very attractive results

less. Wash the film in running water for at least two minutes. Add a little wetting agent to the final rinse, and hang the sheets up to dry in a dust free area.

Printing procedure

Before beginning to print, make sure that your safelight is truly safe. Lith film requires a red safelight, rather than the amber colour of a safelight designed for paper, as it is more sensitive. You may find it necessary to tape red paper over an amber filter, and to carry out a safety check (see page 311).

Start by making a test strip, as you would for paper, using your chosen negative. But since lith film is faster than

paper, close the enlarger lens down by one or two stops more than usual. Process the film and choose the exposure which gives the range of blacks and highlights that you want.

Also carefully examine the edges of the black areas. They should be sharp, with no hint of fuzziness. If they are not, then check that your developer is correctly made up and used at the right processing temperature. Poor edge definition also arises if you are tempted to compensate for underexposure by overdeveloping.

Having selected your exposure, you can now make a lith positive—known as an interpositive. This must be contact printed on to another sheet of lith film to make an internegative before you can make your final print on paper.

You must always contact print emulsion to emulsion. If you do not, the thickness of the film separating the two emulsions can cause rays of light to be scattered, giving loss of detail.

When contact printing, it is important to make sure that the two emulsion surfaces are in perfect contact. The simplest method is to use a plate glass sheet which has been thoroughly cleaned beforehand. Make sure that there is no dust on either the film or the negative, as this can cause 'pinholes' in the image. Always watch for 'Newton's rings', caused by imperfect contact between surfaces. With the enlarger at the same height and aperture as when making the interpositive, you should be able to use the same exposure when making the internegative, though this is not critical.

You are now ready to print the interpositive on to a sheet of film, using your predetermined exposure. Process the resulting negative and print it directly on

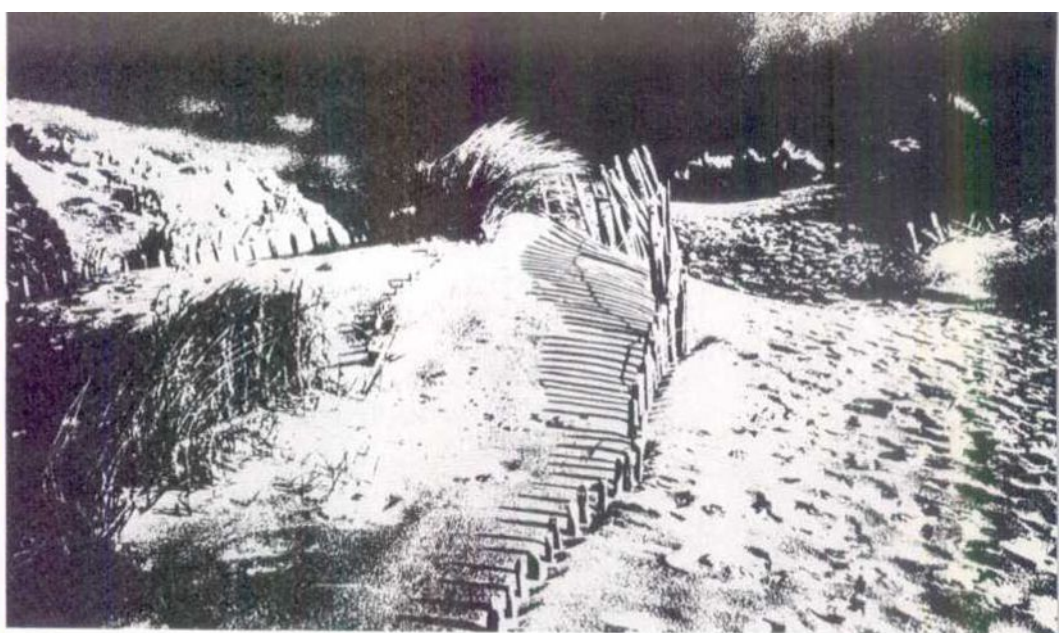


4 Process your print in paper developer and dry it. The result should show clean blacks and whites. If it shows spots, your negative may need retouching

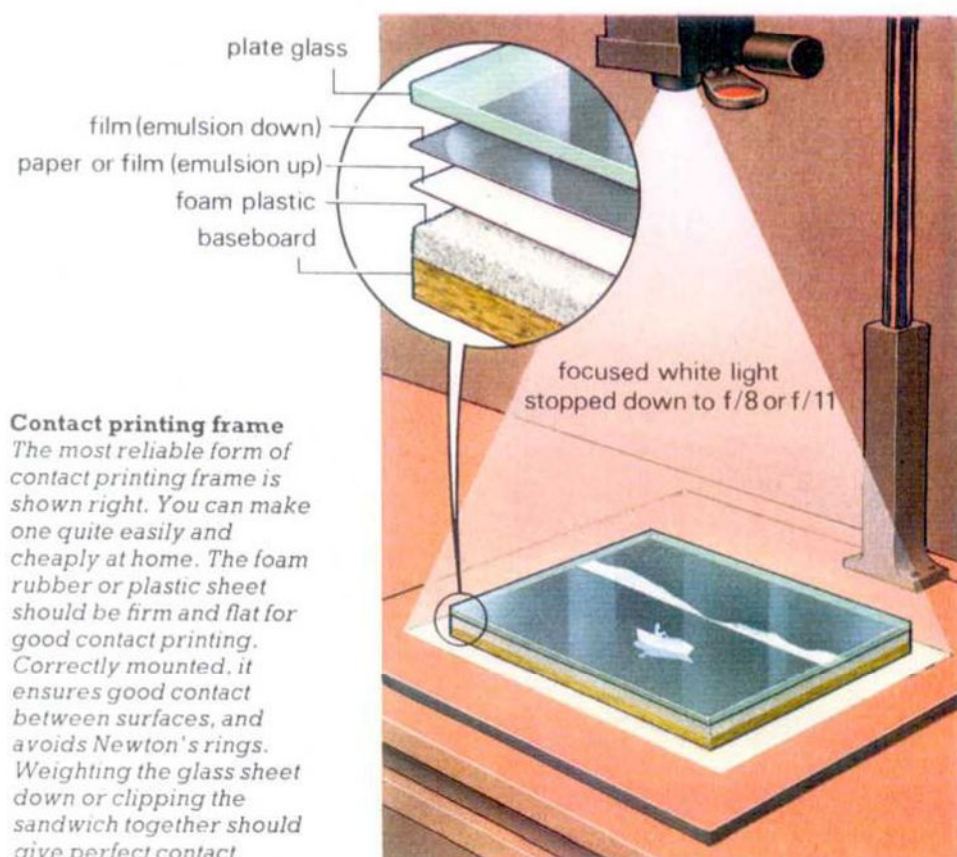
photographic paper to produce your final print, processing it in the normal way in paper developer.

Retouching

Lith film is particularly susceptible to 'pinholes' caused by specks of dust in dense areas and light scratching which occurs during processing. You should take great care to avoid these, by ensuring that there is no dust on the film or



Barry Lewis/Network



Contact printing frame

The most reliable form of contact printing frame is shown right. You can make one quite easily and cheaply at home. The foam rubber or plastic sheet should be firm and flat for good contact printing. Correctly mounted, it ensures good contact between surfaces, and avoids Newton's rings. Weighting the glass sheet down or clipping the sandwich together should give perfect contact

Sand dunes The two prints above show how not even a high contrast bromide print can approach the contrast of a lith print. The shadow of the fence in the bromide print (above) shows quite different contrast to the lith print (top) which is rendered as black

in the developing tray. If they persist in appearing, however, they can be retouched with Indian ink, or a spirit-based retouching pen or special opaque paint.

Large areas that need blocking out can be covered with lithographers' red masking tape, available from any good graphic arts shop. If you plan to use your lith negatives for colour printing (see pages 858 to 861), do not use red retouching medium, as this prints green. Retouching in black avoids this.

Your lith negatives can be used to contact print on colour paper as well as on bromide paper. By using different filter combinations you can colour all or part of a print as you wish (see pages 858 to 861). Since you can use both positives and negatives as masks to colour different areas of a print, there is great scope for a variety of creative effects. The more advanced techniques for making coloured prints from lith are fully covered in subsequent articles.

Paul Williams



Improve your technique

Using motordrives

Many photographers use motor drives only for capturing the action of fast moving sports subjects, but they can be just as useful for finding the best image when the action is much slower

A motor drive can be an invaluable addition to the camera—not only for firing off frames rapidly to capture some dramatic action, but also in many less pressing situations. But unless used properly, a motor drive can be a liability, swallowing up film in a matter of seconds to little effect.

One of the most popular uses of a motor drive is for shooting sequences of photographs in circumstances where advancing the film by hand is simply not fast enough. If a factory chimney is being demolished by explosives, for example, there may be only three seconds in which to take your pictures. With a fast

motor drive, you could get as many as 18 photographs before the chimney stack crashes to the ground—if you were winding film by hand, you would be lucky to get five frames.

When you are using a motor driven camera in the continuous mode like this, you should plan your pictures carefully. It is often possible to predict how the action will progress and set up your camera to exploit it to the best effect. At a motor race, cars usually emerge from a curve at a similar point, and you can ensure that the car is well focused and centred in the picture by prefocusing the camera and framing carefully.

If the subject is travelling so quickly that it moves rapidly out of frame in the course of several exposures, try and compose the picture to take in a slightly wider view, so that instead of moving out of shot, your subject moves through it. Though it is possible to pan a camera while using a motor drive—by swinging the camera round to follow the subject—this is more difficult than when you are only shooting one frame. While the actual exposure is being made, the camera's viewfinder is blacked out, so the image appears to flicker as film is being exposed.

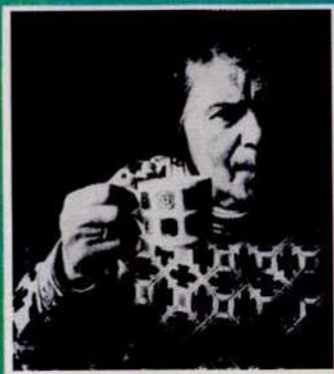
Because you cannot see the image in



Jan-Claude Grellet/Sepia

Billowing skirts When subject presentation is changing quickly, you can use a motor drive to cover all the action and then pick the best images later

A cup of tea Expressions change very quickly and it is easy to miss the fleeting glance which makes the shot. With an autowinder, the camera is always at the ready





Heather Angel

Mouse on a log Sometimes it is not possible for the photographer to be present while a picture is taken. Here, the shutter on the camera was released automatically each time the mouse broke an infrared beam. A motor wound on the film while the photographer slept in nearby car

Learning to ride A series of pictures often says more than a single image. The struggles of getting into the saddle would not seem so amusing in just one photograph of the event

the viewfinder, focusing can prove difficult too. It is virtually impossible to 'pull focus' to keep the subject sharp while you are using a motor drive. Either stop the lens down so that there is plenty of depth of field, or, if this is not possible, make sure that the subject moves across the field of view of the camera, and not towards or away from it. This will ensure that it always remains in the plane of sharp focus, and does not appear blurred in the final frame of a series, even though it was sharp when the shutter release was pressed for the first picture.



Jon Wyand



Barry Lewis, Network

High speed

For continuous running, the framing rate of a motor driven camera is partly dependent on the shutter speed in use, and if you want to shoot pictures very rapidly, you should use a shutter speed faster than 1/250 second. There are other factors that affect the speed of a motor, and the most important of these is the type and condition of the batteries. Like any battery powered device, a motor drive will run faster if you are using a fresh set of cells. The power output of different types of cells is rarely equal, too, and if your drive accepts nickel cadmium cells, use these for the fastest possible speed. Dry batteries—Zinc carbon cells—give the slowest speeds of all, sometimes a third slower than nickel cadmiums.

If you can lock the mirror up on your camera, you may find that this gives a significant increase in speed. Moving the mirror up and down, and opening and closing the lens aperture, puts a considerable drag on a motor. If this drag is removed by locking up the mirror, the mechanism can operate far more quickly. Unfortunately, the viewfinder image disappears when the mirror is locked in the 'up' position, so the camera can only be used on a tripod, with the subject carefully framed before shooting.

There are circumstances where a continuously running motorized camera is not the best way to capture fast moving subjects. A golf ball, for example, is only in contact with the club for a fraction of a second, and even the fastest motor drive is unlikely to capture that moment by chance. Only use the continuous running facility of an autowinder or motor drive when it is absolutely essential, because you may otherwise find that the camera's shutter is open just before and just after the precise moment of action that you wanted to capture. It is sometimes much better to use the motor in the single frame mode, and fire at the right moment.

Economy tip

A motor drive or winder can help you in other ways, besides just making it easier or faster to take pictures. If you routinely have duplicates made of your slides, for example, you will find it cheaper to take several photographs of the original scene, rather than copying a master transparency. For projection purposes, this is ideal, because if one slide gets lost, you still have an identical copy.

This technique can also save money on colour negative film, under certain circumstances. When you are photographing a group of people, each of whom wants a copy of the picture, the cost of reprinting from one negative can be high. Instead of making one negative, expose as many consecutive frames as there are people, and have the film developed and enprinted. Enprints ordered at the time of processing cost only half as much as reprints, and even taking the cost of film into account, you still save money.

One frame at a time

The ability of a motor driven camera to expose a dozen frames of film in a matter of seconds makes it invaluable for capturing action, but its other mode of operation—of advancing the film each time you take your finger off the shutter release—is equally valuable.

With a motor drive or autowinder on the camera, you can be ever ready to take a picture, and there is no delay between frames while you wind on the film. Because a motor driven camera frees you from the chore of constantly winding film, it also means that you can take several pictures in succession, concentrating fully on the subject.

When taking candid photographs, for instance, you may find that people frequently look up when they hear the click of the camera shutter. Although a picture often looks more natural when a subject is looking away, the direct stare of someone who is aware that they are being photographed can produce a potent image. Too often, this eye-to-eye

contact is missed, because the camera is hastily lowered to wind on the film. When you are using a motor drive for candid pictures, do not just shoot one frame, but wait, and take a reaction shot when your presence is noticed. You do not need the high framing rate of a true motor drive—an autowinder will do just as well for this type of picture.

Even when your subject is fully aware that you are taking photographs—a portrait session, for example—a motor winder can still be very useful. To put some action into your pictures, you can arrange for the model to walk towards you as you walk backwards at the same speed. With a motor winding the film, you can hold the camera steady enough to maintain accurate framing and focus. This is much more difficult if you are winding film by hand.

Try using a motor for static portraits when your sitter is nervous, because you can work quickly enough to prevent your sitter from assuming a fixed posture or expression. A picture session can sometimes be an ordeal for people who are not used to being photographed, and they often stiffen up just before the shutter release is pressed. If you can release the shutter in bursts of several frames, each separated by a fraction of a second, your sitter will know that it is pointless trying to put on a show for the camera. With luck, they will then relax a little and let their true personality come through. The motor drive makes sure that you are ready to catch the kind of fleeting glance that can make the most natural portrait.

When photographing children, put the camera and motor on a tripod. Use a long cable release to fire the shutter. This allows you to sit much nearer to boisterous or nervous children, and draw their attention away from the camera. If the noise of the film being advanced is a distraction, put some music on to conceal it. Remember to stop down the camera lens sufficiently, so that the children do



not stray out of the zone of sharp focus, and make a mental note of the boundaries of the frame, so that they stay within the picture, too.

This technique works well with adults as well as children. If your motor drive can be used with a long electric release, you will find it easy to move around the room and chat to your sitter. This makes it easier for him or her to settle down and forget the camera. You can then release the shutter when the expression is exactly right.

The natural world can change just as quickly as the expression on someone's face, and a winder or drive helps you keep pace with these changes. For landscape pictures, a winder can be very useful, particularly on a windy day, when cloud patterns can alter in seconds, and fields of waving corn or hay make a constantly-changing abstract pattern. A sunrise or a sunset sometimes seems to last for ever, if you are just sitting watching it, but when you are trying to shoot a dozen or so pictures by the light of dawn, you quickly realise how fast you must work to catch the sun on the horizon. In actual fact, the time that elapses between the first rays of light appearing, and the whole circle of the sun becoming visible, separate from the horizon, is only about 2½ minutes. If you have camped on a mountain just to catch that moment, you need to work quickly—and a motor drive or autowinder is invaluable.

At the other end of the scale, a winder can help you keep the camera still when you are shooting static objects. When copying a number of similar sized pictures or documents, for instance, it is very easy to jog the camera slightly when you wind on the film. With a motor, this problem is eliminated, since you

A bird in the hand An autowinder may give you the extra speed of operation to catch those unrepeatable moments as they crop up



need not touch the camera to advance the film.

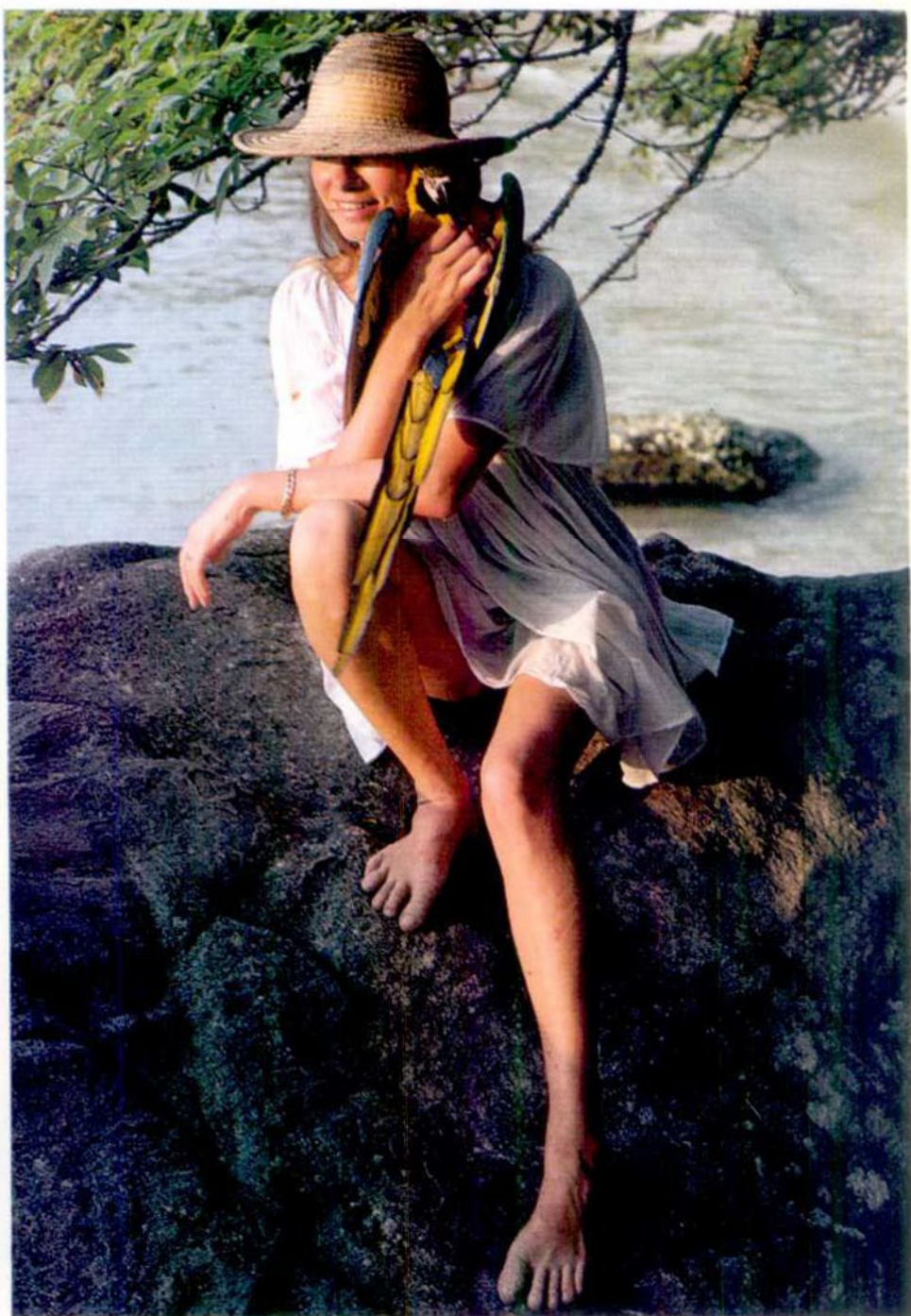
A similar problem occurs with close-up work. When bracketing the exposure for several pictures, the camera sometimes moves when you operate the lever wind between frames. The movement may be very slight, but at short distances, even a couple of millimetres matters.

There are some situations in which a picture would be impossible without a motor drive. If it is particularly dangerous or uncomfortable for a photographer to operate a camera, a remotely controlled, motor driven model can be used, and operated from a distance. The shutter can even be triggered automatically, when the subject breaks a beam of infrared light. A subsequent article shows how to use a camera by remote control.

Similar problems—of access to controls—are encountered in other hostile conditions. Underwater, the camera must

be enclosed in a special housing, and a winder or motor drive helps to eliminate a possible source of leaks around the film winding lever.

Finally, do not overlook the possibilities of a motor drive or autowinder for multiple image pictures (see page 515). By setting the drive to continuous, and holding in the rewind button on the baseplate of the camera, successive images will be exposed on the same frame of film. On some cameras, each image appears in register, so if the camera is on a tripod, an effect similar to a stroboscope is produced. Moving objects appear several times in the same frame, and the background appears normal. Other cameras do not eliminate slight movement between exposures, and a staggered effect is produced. Either of these techniques can be used creatively, but remember to reduce the lens aperture to take account of the extra exposure.



Colourmaze

Photographers interested in abstract forms and colour can find plenty of subjects in the modern environment. For this assignment, Ian McKinnell chose a novel location

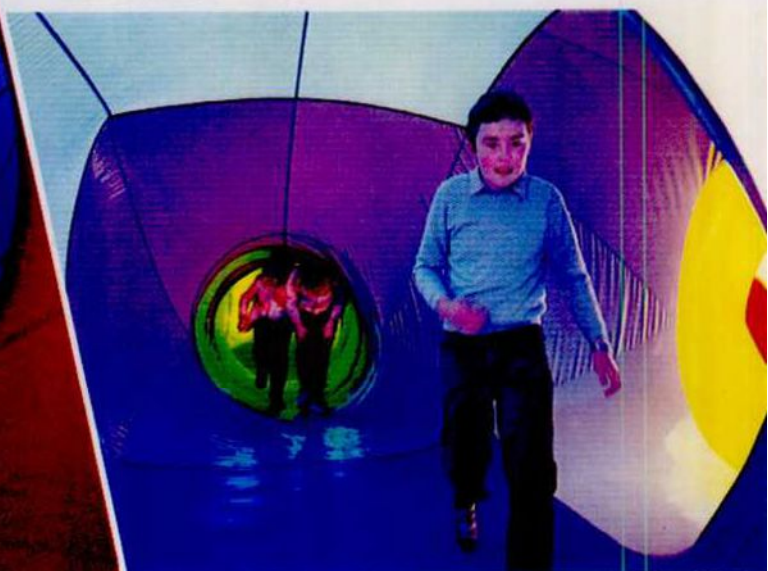


Hands *Ian constantly looked for additional features to add relief to the bright colours*

Young people

These shots show how the presence of the children helped Ian to include some variety

A former graphic designer, Ian McKinnell has become interested in colour and shape for his subject material. Ever thinking of colourful new subjects to photograph, Ian visited a 'colourmaze' at a local fair. This is a structure consisting of nine inflated compartments linked by tubes. Around 20 children are allowed into the structure at a time and the combination of colour, abstract shapes and the children created unusual





photographic opportunities. Structures like this are now quite popular forms of recreation and are just one example of the sort of thing to look for if you want to create a more unusual set of pictures.

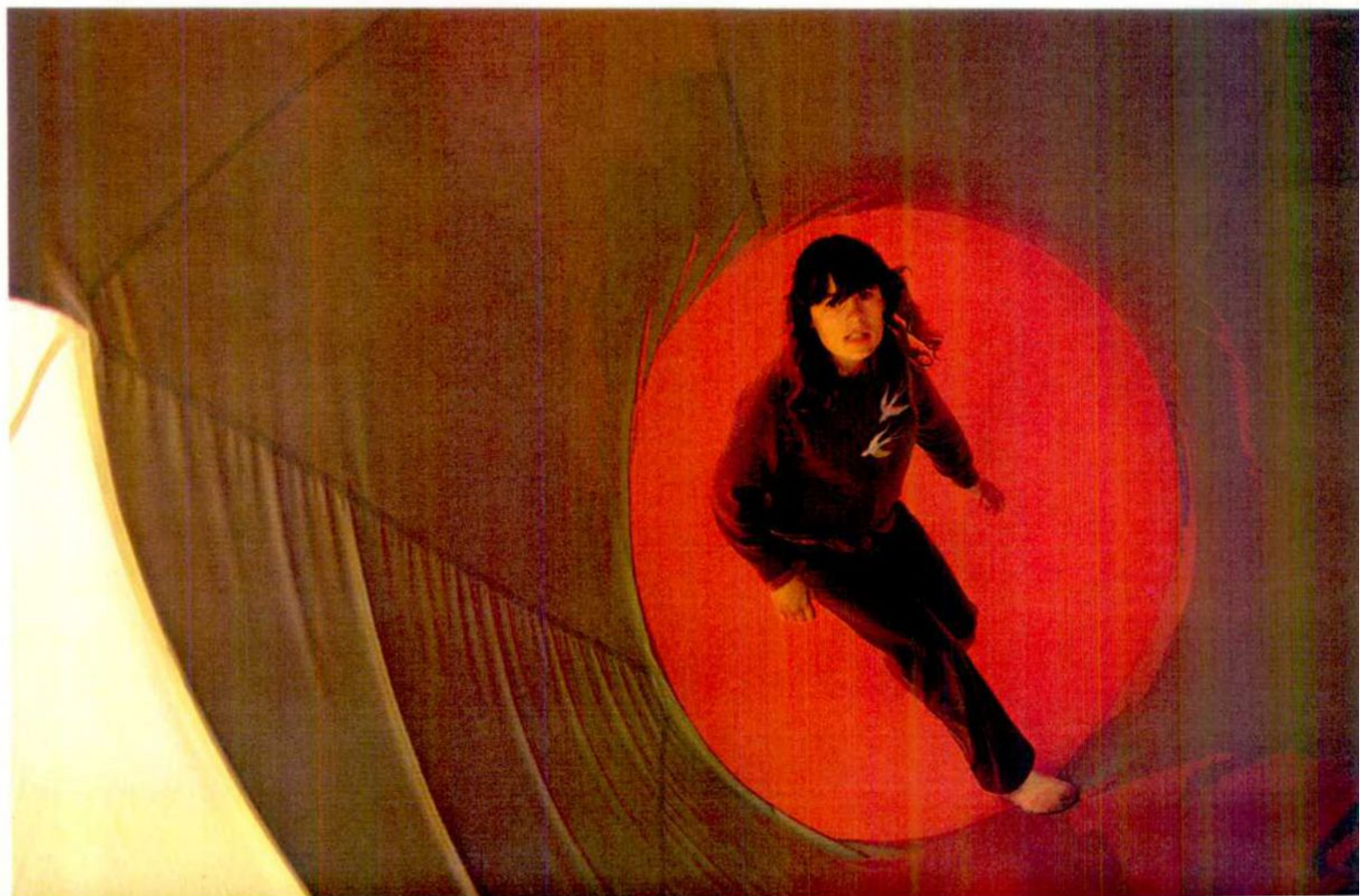
While the children ran about absorbed in their play, Ian walked around taking photographs with two Nikon F2s, one fitted with a 55 mm macro lens—a Micro-Nikkor—and the other with a 28 mm wide angle. The 28 mm proved most useful—partly because of the large expanses of colour a wide angle lens takes in, and partly because the children were in constant motion and Ian had little time for careful focusing and needed the great depth of field such a lens offers.

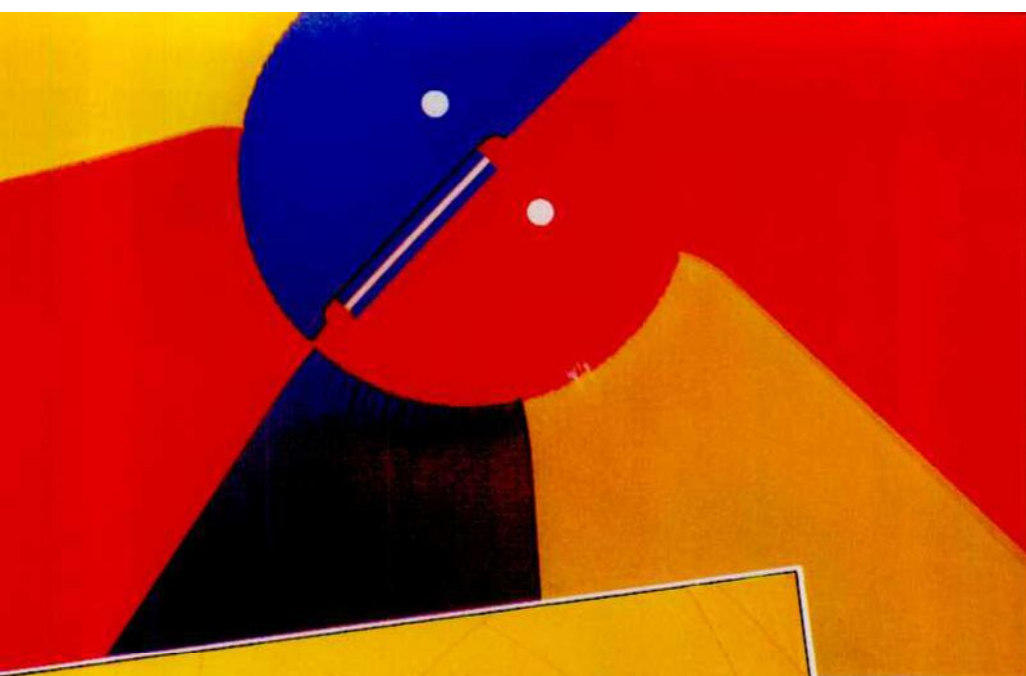
The results Ian produced were achieved without any filtration, but he used slower transparency films to ensure

that the colours reproduced strongly. He did not have to worry unduly about the colour balance—the unusual cast is attractive. He even took the opportunity to use up some slightly outdated film. Some shots were taken on Ektachrome 64 and some on Kodachrome 64 but both proved very good for coping with the brilliant colours.

Exposure varied widely with the intensity of the different colours but, generally, Ian opened up one stop from the meter reading in the darker sections and closed down the aperture one stop for the lighter parts of the colourmaze. However, Ian explained that 'the trannies

Colour roller Not far from the maze, Ian came across this large tube which also attracted large numbers of children. He took this shot to show what the exterior looked like—the appearance can be compared with the large expanses of bright backlit colour which are found inside. **Abstract** For closer shots of the interior of a maze or a tube it is not really of any importance to show the relationship of the detail to the whole—you can even forget about holding the camera exactly horizontally or vertically. **Young girl** Here an interesting shape has been made by tilting the camera out of the horizontal plane

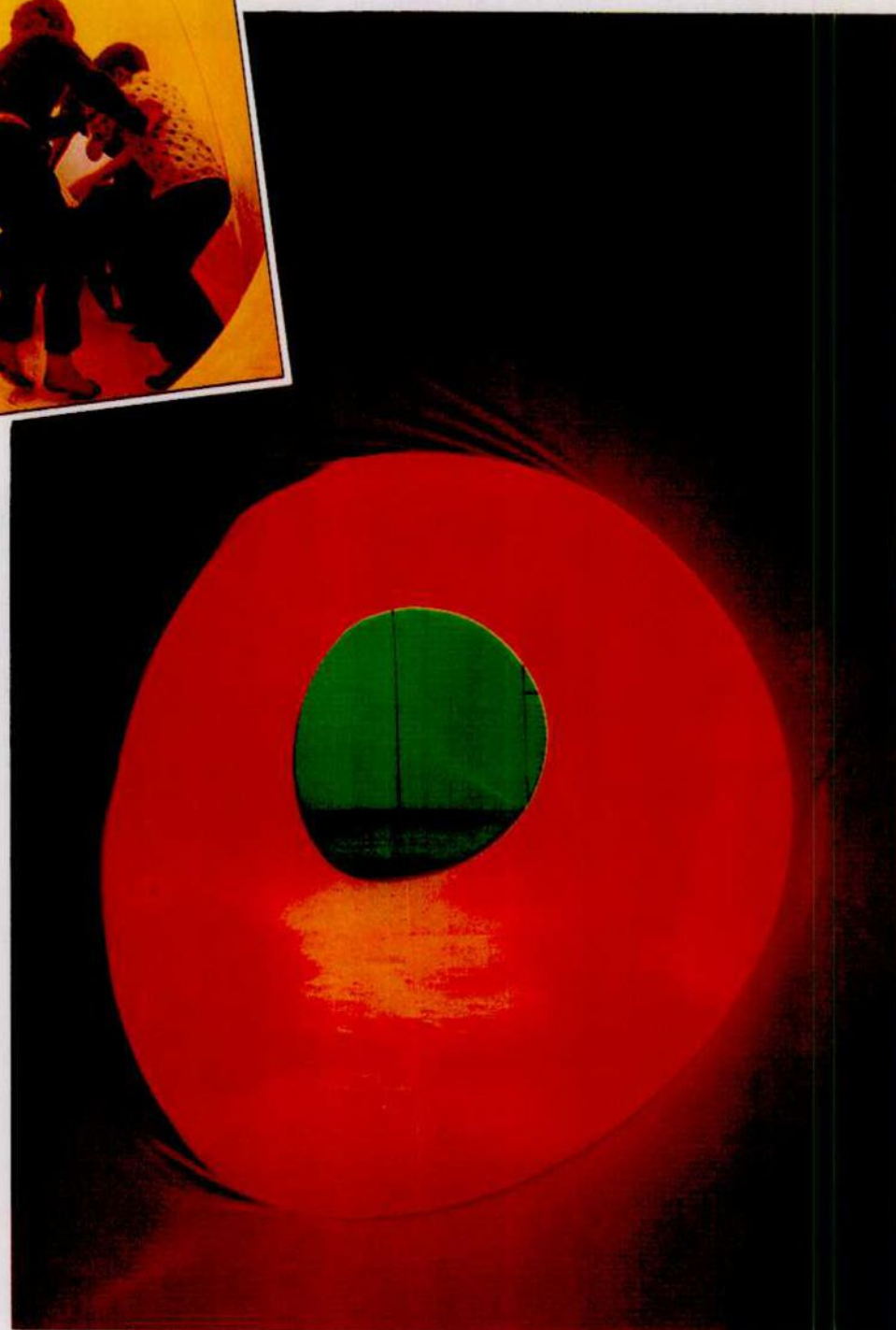




Study in colour (above left) For the bright, varied colours Ian used the meter in the camera to gauge his exposure settings, but was always sure to bracket so that he had slightly over- and under-exposed versions of the same shot. **At play** The excited youngsters hardly noticed Ian at his work. **Deflated** Even after the fun was over, Ian lingered to grab some additional shots. **Cave of colour** The darker areas of colour needed to be overexposed by one stop

tended to be slightly underexposed and I was glad that I had bracketed every shot and always had a brighter one to choose from. I use manual cameras because I find bracketing very difficult with automatic cameras, and I think that this is a very important technique for transparency work, especially in difficult lighting such as inside these inflatables.'

Ian also added, 'For fast moving situations like this when children are running around excitedly, there is no time for thought or careful study and one is reliant on instinct and experience—constantly remembering to make sure that exposure is correct. I took as many shots as possible, knowing that I could put most of the thought into selecting the pictures down to a few good shots after they were exposed.'





Darkroom

Simple posterization

The high contrast reproduction obtained with lith film allows you to eliminate certain areas of tone in a picture. By combining different lith negatives you can create striking poster-like effects

Much of the appeal of the lith process lies in its ability to produce images that consist of just two tones—ideally deep black and pure white. Many images can be transformed by eliminating all the grey tones completely (see pages 914 to 917), and simple lith work can therefore be called tone elimination. But a whole range of additional effects are possible, using the techniques of *tone separation* and *posterization*.

By printing with lith, you are in effect dividing a continuous gradation of tones into just two—black and white. All areas lighter than a certain tone are reproduced as white, and all areas darker than that tone are reproduced as black. You fix the point at which the division comes by controlling the exposure.

By exposing lith film for a longer or shorter time, you can determine the 'cut-off point' at which a mid tone becomes black. For example, if you are working with an image of a face, a short exposure will record only the darkest parts of the eyes, the nostrils and the mouth, which will all print as black. A medium exposure will produce a result with more detail—grey tones may well reproduce as a fine stipple, lending some moulding effect. A long exposure will pick up all the shadows, and when printed may yield a sombre, mysterious image. Only the brightest parts of the original will print as white.

In such a case, where you are making lith positives from a continuous tone negative, the underexposed film is called the shadow positive, since only the shadows and black areas are reproduced. The overexposed film is the highlight positive, as only the brightest areas will print. Standard exposure gives a mid-range positive. Each positive can be contact printed on lith film to give shadow, highlight and mid range negatives.

You may, if you wish, make prints from nearly all negatives or positives—though probably not all of them will yield very interesting results. You can also experiment with exposures between those you have chosen, to bring out some particular feature. Lith film is capable of quite fine discrimination between tones, so it may be possible, for example, to include either a mid tone item or exclude it altogether simply by varying the exposure.



Geoff Winkley

A posterized print, made from a normal black and white original, owes its unique quality to separate areas of flat tone rather like those in a poster

Experimenting with lith

When making lith positives and negatives, the most important stage in choosing the point at which the tones are separated is the test strip, as this gives you vital information as to how the negative reproduces with different exposures. The 'standard' exposure for lith is that which reproduces full blacks and clear whites. If you already have an idea of what that exposure is, you might try exposing the lith sheet for a range of times above and below this. If you do not know what standard exposure is then it is best to expose a test sheet over a wide range of times, to obtain as comprehensive a sample as you can of the possible tone combinations.

When you have exposed the test sheet, develop it as normal and let it dry. You should view it by daylight or a good room light, as the blacks appear misleadingly dark under a safe light. When you have selected your exposure, make your positives as normal, but make sure that you always use fresh developer and develop for the correct time, or you will get a different degree of tone separation

from that in your test sheet.

Your final prints will show black and white tones, but you can also reduce the exposure on the bromide paper to obtain a grey and white print. This is still a two-tone print, but you can control the intensity of the greys, so that the tone separation is maintained but the effective contrast is reduced.

As well as using negatives as your originals for lith work, you can also use transparencies. To produce a black and white positive print only one intermediate film is needed, as you are already working from a positive. The first lith print is a negative, and can be used to print directly on paper. By making a further lith contact print, you produce a positive which gives a negative effect on paper, should you wish to do this.

Bear in mind, however, that as there is only one intermediate stage, the final print will be laterally reversed if you always print emulsion to emulsion. The simple remedy is to place the transparency back to front in the enlarger when making the internegative.

Making tone separations



30 secs at $f/16$



12 secs at $f/16$



5 secs at $f/16$

The three separation positives above are, from left to right, the highlight, the midtone and the shadow positive



4 secs



4 secs



4 secs

The separation negatives correspond to the positives above but reproduce the same tone ranges inversely

1 The separation positives are printed using exposures selected from the test print. Notice how each sheet reproduces a different tone range, the highlight print showing only the highlights, and the shadow positive only the shadows

2 Each separation negative is printed directly from its corresponding positive. Exposure is the same for each separation, as the different tone ranges have already been separated at the positive printing stage



3 The final posterized print is made from all the negatives printed in register on bromide paper. Make a test print to find which exposure gives medium grey on the paper, and use that exposure for each separation. Notice the flat areas of grey, black and white, and the absence of any tone gradation. Although you can theoretically print any number of separations, the more you make, the closer you get to a continuous tone print, so it is better to make only a few separations for the best effect

Geoff Winkley

Whereas from a black and white negative either orthochromatic or panchromatic lith film produce the same results, in printing from transparencies you have added control over any red areas of the photograph. Panchromatic film gives the same effects as a monochrome negative, but orthochromatic lith reproduces all red areas as very light in the first (negative) print, and as very dark in the final paper print or the lith positive.

By printing either the lith negative or the lith positive on paper, you can reproduce the red areas of a photograph as either unnaturally light or unnaturally dark. This can create striking, unreal effects, with falsified tone values. In practice, what you are doing by printing on orthochromatic film is introducing filtration.

When you are working from a trans-

parency, the procedure is exactly the same as with a negative, and you must make a test sheet to determine your tone 'cut-off point'. When selecting transparencies for use on orthochromatic lith film, you should bear in mind that the more red there is in the subject, the more unreal and falsified the final result will be. Experience will tell you which colour combinations lend themselves most readily to this kind of treatment.

Negatives made on ortho film are more grainy than those on pan film, as the blue-sensitive emulsion records only one layer of the film rather than all three.

Multiple tone printing

When making a tone separation, you convert a continuous scale of tones into just black and white. However, this same continuous scale can be split up into more than two tones. You can, for ex-

ample, make a print in which the shadows are black, the highlights are white and the mid tones are an intermediate shade of grey. Indeed, there is theoretically no limit to the number of intermediate tones you can introduce into a tone separation print. The more intermediate tones you print, the closer the final result will be to a continuous tone image, but it will still consist of separate, flat tones.

The images you obtain by making multiple tone separations have a pleasing, graduated quality. The introduction of intermediate grey tones produces a softer effect than a straight two-tone separation, but you can still control the effective contrast by controlling the shade of grey. You also maintain control over what you include in the picture, and what emphasis is given to the various features.

Multiple tone separations are made by printing several different lith negatives on the same sheet of paper, one after another. Each negative has different areas of black tones, and acts as a mask for a given part of the print. At the end of the printing process, different parts of the paper will have been exposed for different times, and will show different tones of grey or black.

For example, if you expose three sheets of lith, underexposing one, correctly exposing the next and overexposing the third, each will show a tonally different positive when developed. One will record only the deepest shadow areas as black, another will record mid tones and shadows as black, and the third will have all tones black except for the highlights. You can then contact these on lith to make negatives for printing.

The three negatives are then printed on a single sheet of paper to produce a tone separated image. To do this they must all fit over the paper in register—that is, they must all be exactly aligned—otherwise the image will not be clear and the edges of tone areas will not fit over each other properly.

A punch system is the best method of registration. This makes two or more holes near the edge of each sheet of film or paper. These holes correspond exactly to pins on the enlarger baseboard, on to which the film will fit. You can punch the material before exposure, and then locate it on the pins in the dark, knowing that the projected image will fall exactly in the same place each time.

After you have processed your lith negatives, you can print them in sequence on the same sheet of paper, as the pins ensure exact registration. A

For the cheaper system, buy a good quality office punch, strong enough to punch holes in a sheet of plastic film without tearing it or buckling it. As you will have to use it in the dark, set it into a board as shown, so that the film remains level during punching. You can make your pins from wooden dowelling, or by cutting the heads from thick nails and filing them down smooth. The pins should be fitted into a piece of board larger than the largest piece of material you are likely to use. A photographic punch cuts two differently shaped holes, so you cannot load the film the wrong way round in the dark. Sets of precision-mounted pins are available, which can be taped to the baseboard.

Before beginning to make your multiple tone separation, you should punch all the material you need in the dark and put it back into light-tight boxes or envelopes. Orthochromatic film and paper can be punched under a red safelight.

When you have selected your negative for printing, place it in the enlarger and project it onto the baseboard. You should leave a wide margin for the registration holes. Having lined up the image, place a register pin bar close to the image and tape it into place.

You are now ready to make a test sheet, which will allow you to select the tones you want to print. You need not register the film for the test sheet, and you should expose it as you would for a single tone separation. Process the sheet and decide which tones produce the tone differences you want. As a general rule, it is advisable to choose the exposure times which produce the most distinct differences. You could choose to make any number of negatives, but for

the first separation it is probably best to use only three.

Take a punched sheet of lith film and position it over the pins on the enlarger baseboard. Expose it for one of your chosen times. Repeat with the other two sheets, giving your other two exposures.

Process all three sheets, then contact print them on three more punched sheets. You should give each of these a normal exposure, to reproduce your positives as faithfully as possible.

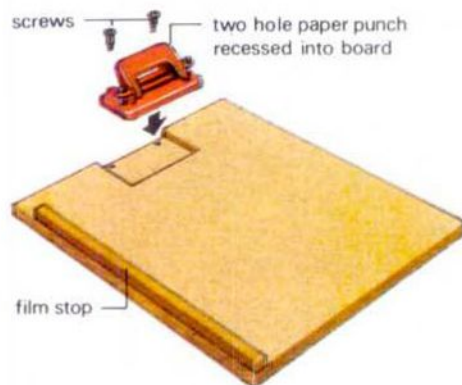
You can now contact print each negative in turn on to a single sheet of normal grade bromide paper. You should give each negative just enough exposure to produce a mid grey tone on the paper. First, make a test print to find out what this exposure is. With the darkroom light on, tape a piece of bromide paper, emulsion side up, next to the pin register bar. Place the first negative, emulsion side down, on the paper, and make a test strip. Process the paper and examine it in the light.

Tape down another sheet of paper, and place the first negative over the pins. Expose, then replace this with the second stage negative, then repeat the process for the third. Always keep to the same exposure, and remember to contact print emulsion to emulsion.

If you have registered each sheet correctly and exposed properly every time, your finished print should now show black, white and two intermediate tones of grey. Using two negatives, you produce only one grey tone; using four, three grey tones and so forth.

As well as printing from three negatives, you can try different combinations of negatives and positives. You might, for example, try printing the shadow positive first, and then print the mid tone negative. Sometimes, when printing both positives and negatives together, you produce thin line effects which are very pleasing. These are caused by the dark areas of a negative being slightly different in size from the corresponding areas of the positive. This allows a little light to pass, forming a very thin line on the paper.

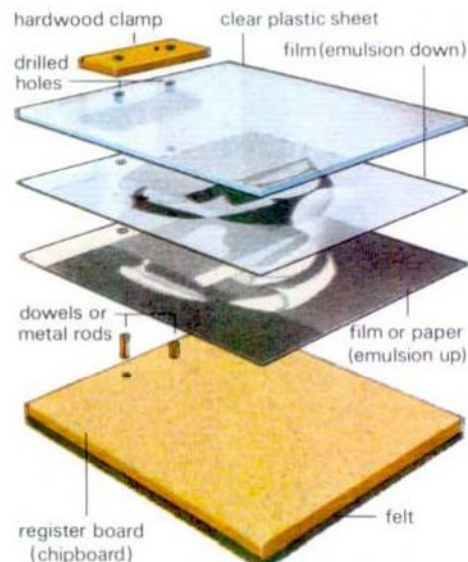
This process of tone separation is in fact a form of posterization. The simplest poster printing method can only reproduce uniform tones, so all images must be reduced to basic tones, which may then be superimposed. A tone separation, or posterization, has the same appearance, as graduated tones and colours have been replaced by flat



good economy technique is to tape a strip of old film along one edge of each lith sheet, and punch holes in this, so as to make the most of your valuable material.

The simplest registration technique is to use an ordinary office punch and a two-pin board which you can make yourself quite easily. Alternatively, you can buy a special photographic punch and a pin bar which can be taped to the enlarger baseboard. Although this is a much more accurate system, it is also much more expensive to buy. However, if you plan to do a great deal of tone separation work, it might be worth the expense.

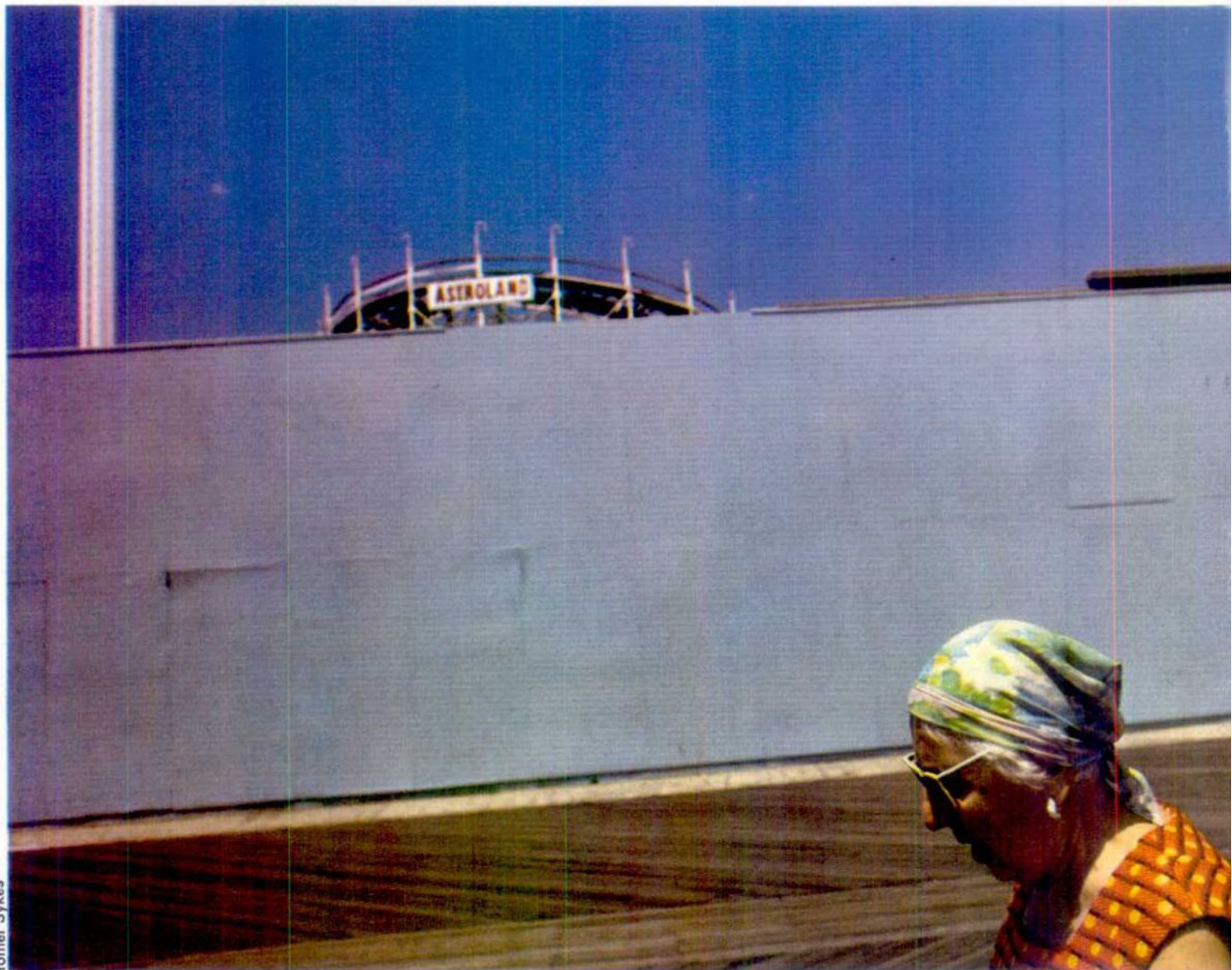
Registration To keep the film exactly level when punching, set the punch into the board as shown left. The method of registration and contact printing shown below gives good results if used with care. If your sheet of film is the wrong size for the pins you can still register it as shown right



areas with distinct borders. Colour posterization, dealt with in a subsequent article, offers even more possibilities than black and white, and once you have mastered monochrome you can easily progress to colour work.

Coney Island

Picture postcard shots of a resort usually show only one side of its character. With imagination you can find many more revealing aspects



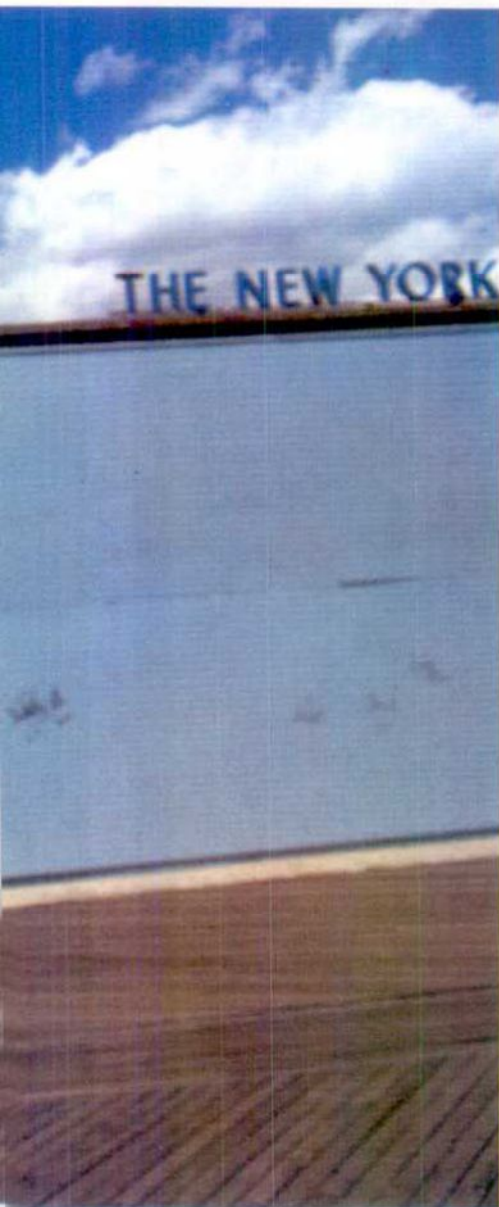
Homer Sykes

Catching people off guard with a camera is not the sort of thing that appeals to everyone—especially if it is to be done in a foreign country. But for Homer Sykes, this sort of photography has helped build up his professional reputation. When he paid a visit to Coney Island, near New York, he spent most of his time photographing the people in relation to the environment, rather than concentrating primarily on the place itself.

In its heyday, Coney Island was known for its spectacular amusement park, but now, while the entertainment still survives, the area has become worn down and its splendour has tarnished. Homer wanted to capture this atmosphere of decay while also making revealing studies of Coney Island's



Old lady Homer noticed the background of this shot first—the soft blues and the small cloud, the lettering and the glimpse of Astroland—and then he waited for an interesting character to walk into the foreground. Robert, John and Martin Initially Homer noticed some people next to these posters but then he moved closer for this eerie detail



Aerial view An overall shot of the area is useful for setting the scene. This was taken through a window and Homer bracketed to guarantee optimum results

visitors and residents.

To photograph people acting naturally, Homer had to be as unobtrusive as possible. This often involved using his 180 mm lens so he could keep his distance—or using a wide angle lens so it appeared to his subjects that he was shooting past them when they actually featured prominently in the frame. Another technique Homer used was to compose a shot which featured an interesting background and then wait until someone walked into the right part of the frame. Sometimes it was quite obvious that Homer was trying to make



Relaxing in the sun This shot was taken because the appearance of the people was so striking. Homer used a 28 mm lens and pretended to aim past them

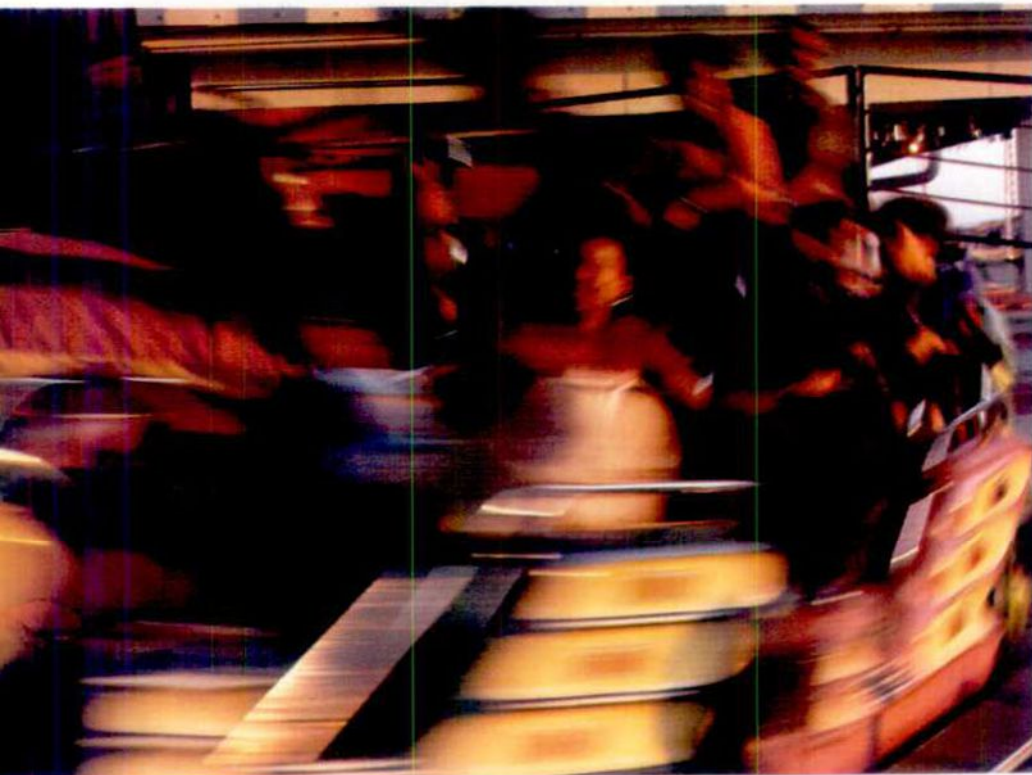
candid studies, but he continued to shoot, hoping that in one of a few frames he would capture a natural expression.

For the type of work he does, Homer finds that a large battery of lenses is unnecessary and he prefers to carry less equipment than other professionals so that he can move about more freely and remain inconspicuous. His standard system consists of two Nikon F2As and 28, 35, 105 and 180 mm lenses. He carries a hand held light meter for emergencies or for odd lighting situations, but usually he relies on the meters in his cameras. The main prob-

lem he had was around the middle of the day when the light was particularly contrasty. This made it difficult to get good shots of people's faces because they were always shaded and he found it far more worthwhile to wait until later in the afternoon and to take most of his photographs in the softer, warmer light.

Apart from the candid shots, Homer also photographed what, to him, represented typically American urban landscapes, mixing bright areas of colour with overgrown, disused buildings strewn with litter—or a horse, symbolic of the open spaces of the Old West, standing, almost ignominiously, next to a shiny new car—a typical symbol of modern America.

All these elements combine to give a poignant impression of the place.



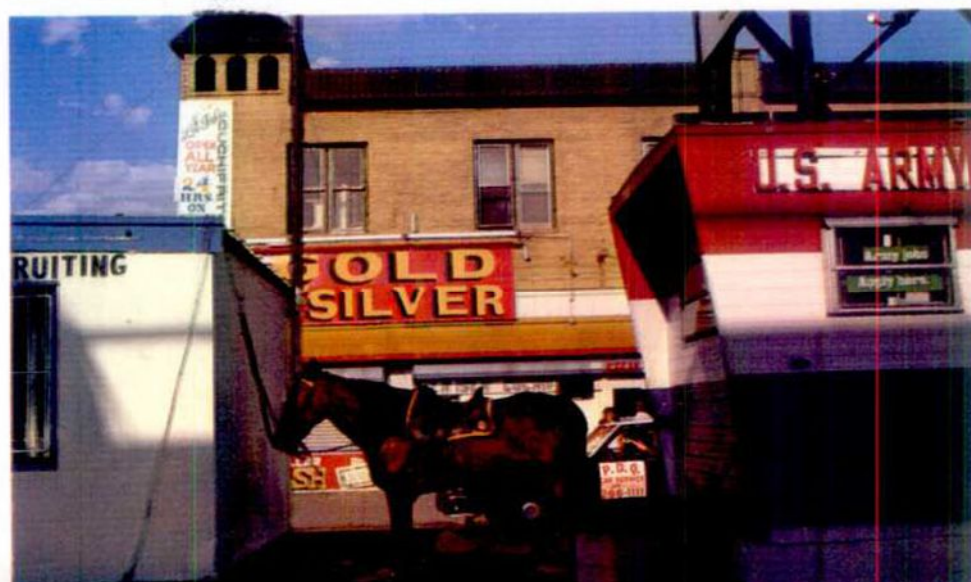
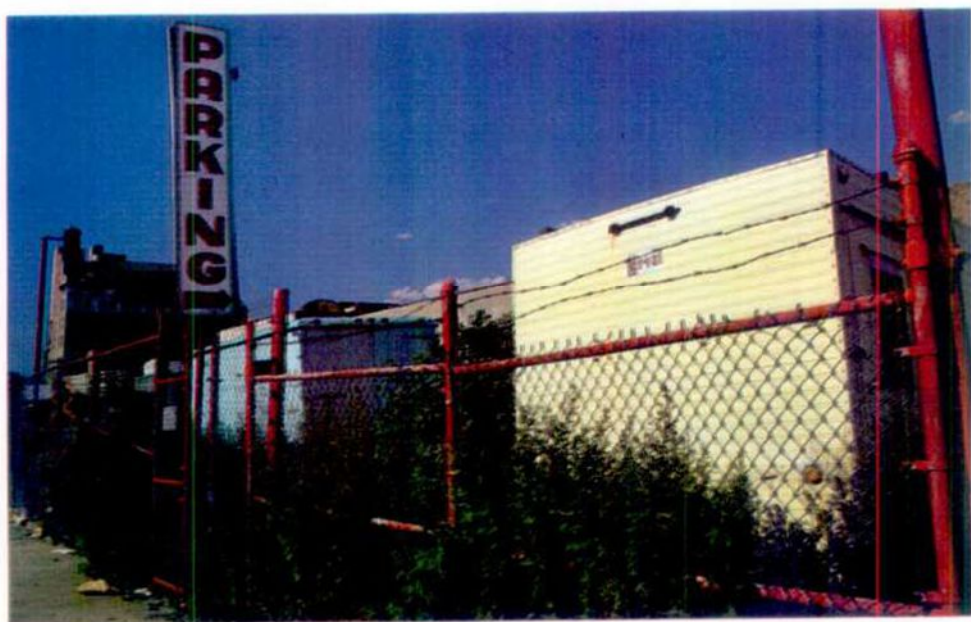
Movement Dynamic pictures of fun-fair rides can be taken with slow shutter speeds—here Homer used $1/8$ second

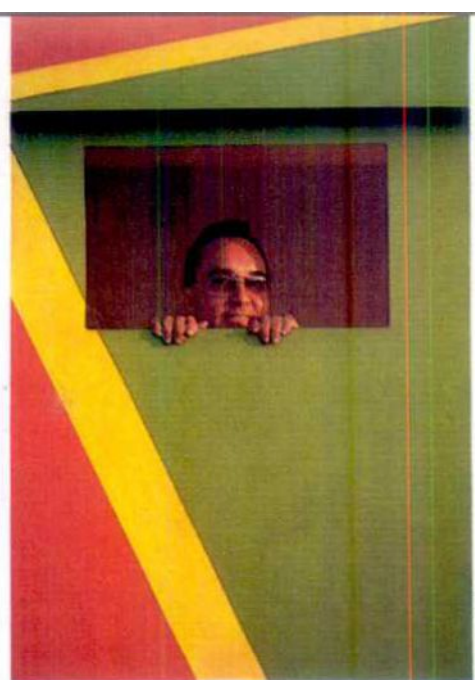


Phone booths Graffiti is everywhere in Coney Island, so these phones added character to this candid shot



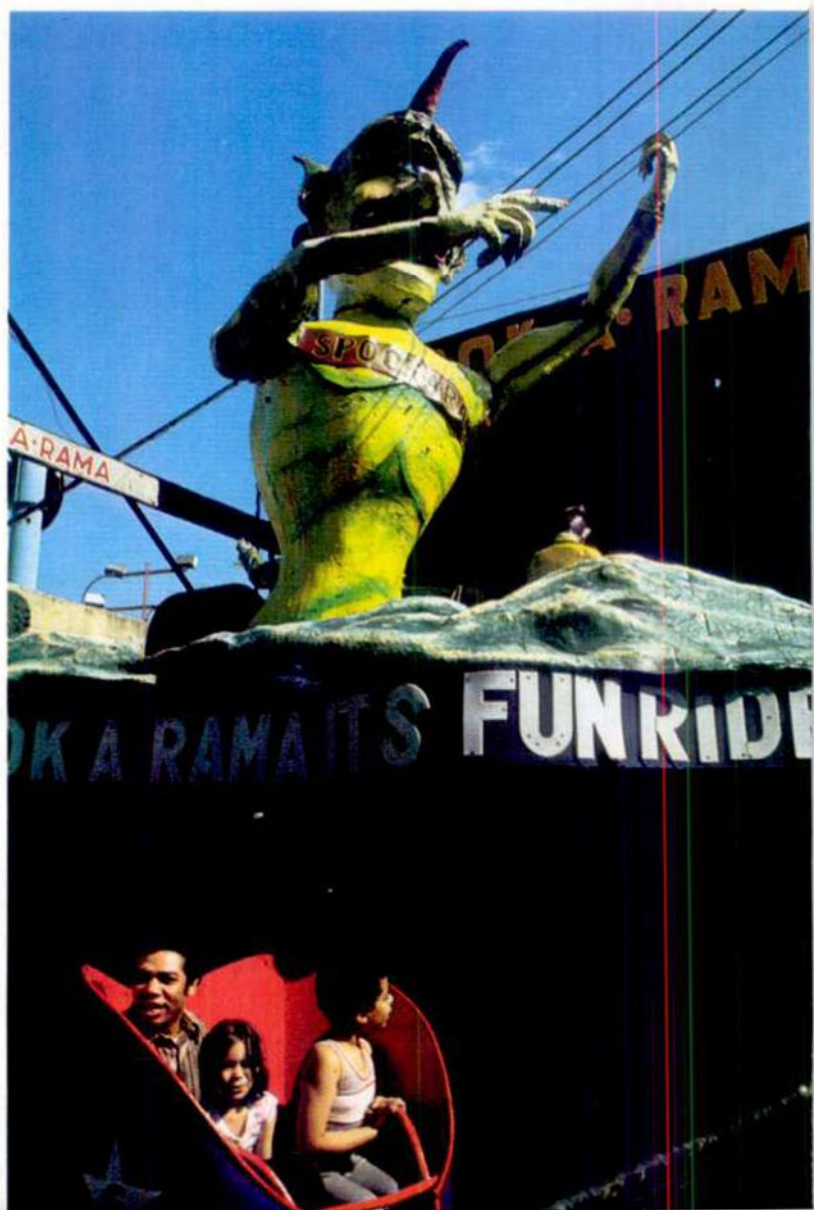
Inflatable pet This shot was taken with the 180 mm lens so Homer could keep his distance, but the overhead midday sun cast a shadow across the man's face. **Car Park** A polarizer was used to deepen the colours of this urban landscape. **Horse** The animal looked rather out of place and made a fascinating subject. A 28 mm lens allowed other details of the scene to be included





Homer Sykes

Peering out The strong diagonal lines, warm light and bold colours dramatically enhance this frame within a frame portrait. **Boardwalk couple** Coney Island is full of interesting characters. A 180 mm lens caught the main details—a pair of hats and cold drinks. **Monster** Homer wanted to feature the monster in a shot so he waited until something interesting happened in the foreground before making the exposure



Lens design

As lenses become more versatile, designs become more complex. Although modern design techniques are very sophisticated, the basic principles remain unchanged

High quality photographic lenses such as those for most SLRs can produce images of startling clarity and sharpness. But designing a lens of this standard, where aberrations are at a minimum and resolution is at a maximum, involves many complex calculations and development procedures.

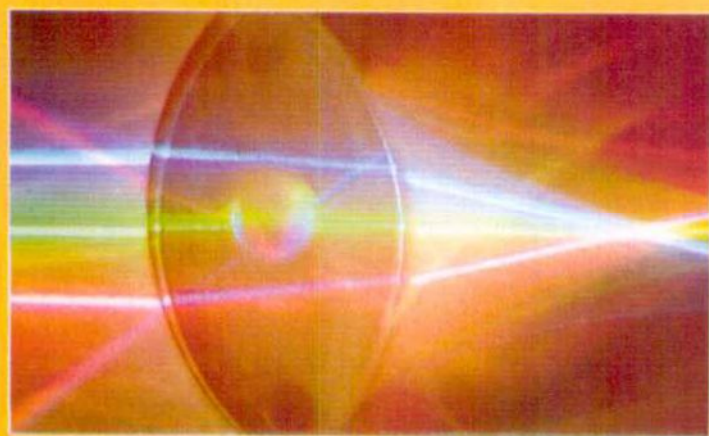
The theory that goes into lens design is generally straightforward. The most important fact that the designer must know is the *refractive index* of the glasses that are to be used for the lens. The refractive index of a glass is a measure of its light bending power—usually measured to several decimal places for each type of glass.

Once the refractive index is known, the lens designer can calculate what happens to any light that falls on the lens and so determine whether the design is a good design before it is actually made. But the calculations are long and complicated, particularly with multi-element lenses such as zooms, and, not surprisingly, computers are now becoming an increasingly important part of the design process. Computers can perform tedious and complex calculations in a fraction of the time taken by previous methods.

A basic starting point is still needed, and this is provided by a design team headed by an optical designer. Their experience and knowledge help to avoid designs which, in the end, are unlikely to produce satisfactory lenses.

Pre-design

The first step in any design process is to identify what the lens needs to do. It may be required to fill a gap in the manufacturer's range, or to replace an old design with a lens that is more compact or has a larger maximum aperture. A *specification* is produced, listing the required focal length, aperture range,



Simple lens The image formed by a simple lens contains many faults. These are corrected by using more elements

field of view, resolving power, closest focusing distance, overall size, and other features.

Most importantly, however, the designers must ensure that the final cost of the lens is geared to the market it is aimed at—a high quality lens is useless if no one can afford to buy it. In addition, there may be special considerations, such as the use of special glass — types of optical glass can vary in cost by a factor of 300 or more.

Designers achieve the required specification by varying the number of glass elements, their shapes—the

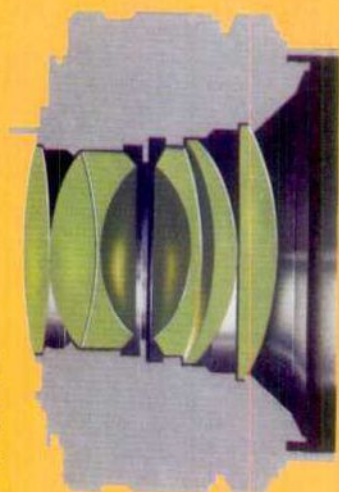
way the surfaces curve, their diameter and thickness — their spacings and the type of glass, plus the position of the iris diaphragm. All these features interact and must be combined to meet the specification with the minimum of aberrations. For example, the number of elements needed is related to the maximum usable aperture and the angle of view required. A 50 mm *f*/2 lens may need six elements where one of *f*/1.4 needs seven. A 24 mm wide angle lens may need ten elements, but a 200 mm long focus lens can perform well with only four.

With general purpose lenses, the final design is often a compromise. With lenses designed for more specialized purposes, one aspect of the design may be given greater importance. For example, a lens intended for copying work is usually corrected for aberrations at the expense of speed and has a relatively small maximum aperture.

Once a possible configuration is decided upon, from experience or a past design, a *thin lens* pre-design calculation is made. This is a quick 'try-out', using a pro-

David Hoffman

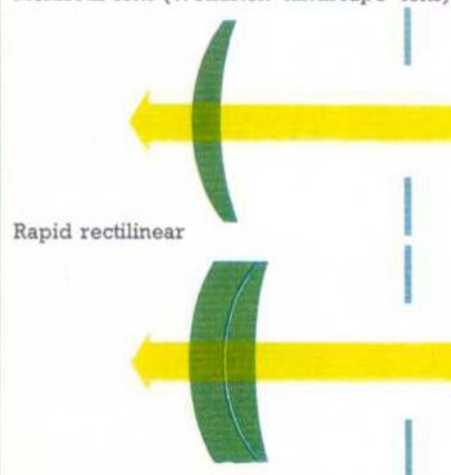
Venner Artists



50 mm standard lens

First improvements

Meniscus lens (Wollaston 'landscape' lens)



Early designs

The top diagram shows one of the first designs to use a stop.

The symmetrical layout of the lower design is the basis for many lens fault corrections

grammable calculator or minicomputer to calculate the effects of the design. The lenses are treated as having negligible thickness, allowing greatly simplified formulae to be used. In this way, the designers can get an idea of the best layout of the elements. These calculations include allowances for different types of glass as well.

The basic routine is one of repeated *ray tracing*—calculating the path of each ray of light as it is refracted by the elements. This is achieved by applying a formula given by *Snell's Law* which makes it possible to calculate the refraction of a light ray at every air-glass surface or glass-glass interface, according to

Venner Artists

the angle at which it arrives, and the refractive index of the glass. Aberrations can also be allowed for in the calculations.

To improve the lens, one of the variables is altered, such as the curvature of one of the lens surfaces or the position of an element, and more ray traces are done to see the effects. Some aberrations are very sensitive to small changes in such variables, others are not. The pre-design is for light of a single wavelength. Later the lens can be colour corrected, by applying a similar process.

Design optimization

The result of the pre-design efforts, often an excellent result, is then further refined by a design optimization program in a computer. This is another ray tracing process which assesses how the finished lens will behave, particularly in regard to residual aberrations (see page

Three standards

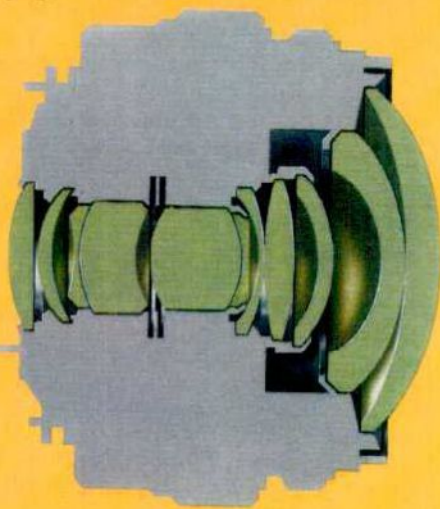
The three 50 mm lenses above all have maximum apertures of $f/1.8$. But they differ in design and size. There is no single answer to the basic design specification

Design variation

Different focal lengths require very different designs, with variations in the number and type of elements



Dave King



18 mm wide angle lens

fractive index of each element in the mount, and other variables. A design with a high rejection rate in manufacture is a costly lens. The design is then reworked until an acceptable compromise is reached, and a barrel and focusing mount designed for it as a separate mechanical design job.

Variety of designs

That there is no perfect solution to a lens design is shown by the variety of lenses with the same specifications — there are, for example, many 50 mm $f/1.8$ lenses—differing in the arrangement of ele-

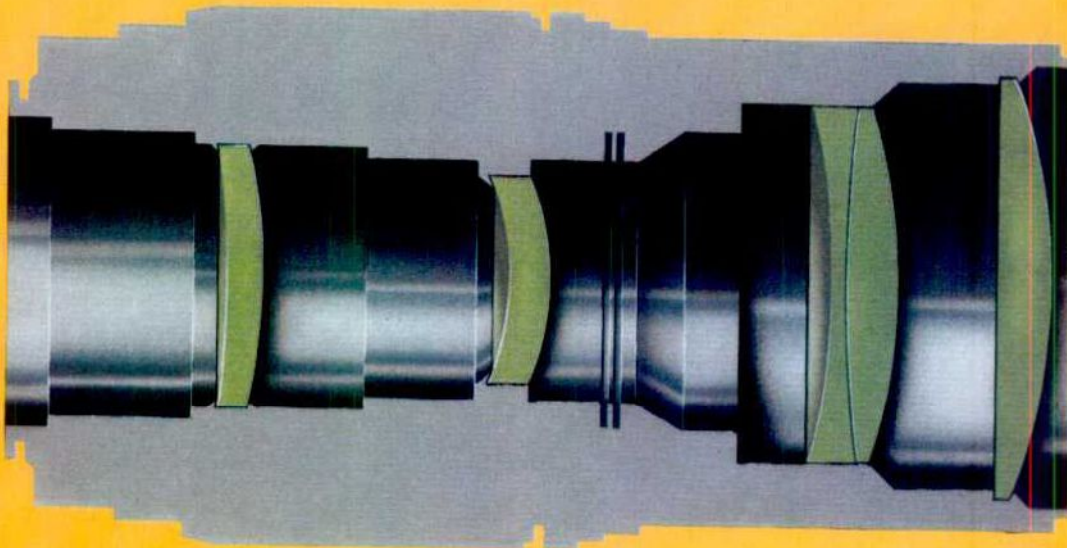
ments and glasses as well as performance.

Lenses also have more subtle characteristics put in by the designer. A lens may be corrected to give a high contrast image at the expense of resolving power, or the converse. It may give a very sharp central image with poorer corners, or a more even overall performance of lesser sharpness. More ambitious designs can now be tackled, such as wide angle zoom lenses, as better configurations are learnt from design progress. A lens may be made in many different configurations.

906). The computer can then present a final design.

Thousands of calculations are performed to rework the lens to give the required performance. The result is then passed on to the optical engineer, who can make judgements as to its suitability for manufacture. An element may be too thin or too steeply curved for easy manufacture. It may be possible, with a curvature which is nearly flat, to actually make it flat by slightly altering other elements, so reducing manufacturing costs.

There must be some tolerance in the design to very slight variations in manufacture and assembly, setting limits on thickness, the re-



200 mm telephoto lens

Venner Artists



Composition and cropping

Good composition relies on careful subject framing, but if you cannot achieve exactly what you want on the spot, you may be able to crop your pictures later

No matter how photogenic a subject is, it will not make a good photograph if it is not properly framed—many otherwise excellent shots lose their impact because the subject occupies too small an area of the frame or is overwhelmed by distracting detail. Intelligent cropping, either in the camera or on the final picture, can often improve a picture considerably, and can sometimes transform it completely.

There are, in fact, two distinctly different kinds of cropping—the first is used to exclude unnecessary or distracting detail to improve the composition, and the second is more drastic and can be used to create an entirely new picture or interpretation of the subject itself.

Some great photographers—Henri Cartier-Bresson, for example—will not allow their pictures to be cropped at all. Cartier-Bresson takes exceptional care to frame his subject tightly, making sure that all distracting and unnecessary elements are cut out, and that the centre of interest is precisely where he wants it to be. In order to do this he crops creatively and decisively, not as an afterthought, but in the viewfinder at the moment of taking the picture.

Ideally, this is where all creative cropping should be done. However, most photographs are taken in far from

ideal circumstances—news pictures and candid shots, in particular. In these cases, events may happen so quickly, that there is no time to do anything other than press the shutter and record the moment. It is much more important to catch the winning goal of the match or the child's expression as he is presented with a giant ice-cream, than it is to achieve the perfectly composed picture. You can always crop out unwanted items later, and centre the interest on the incident itself.

In order to crop creatively, you should be aware of the elements of design which are involved in the making of a good picture. Cropping can be used to emphasize or enhance certain design elements, or to diminish or conceal others. Even before you have pressed the shutter, part of the picture design has already been chosen for you.

For instance, the ratio between the width and the height of the frame is determined by the format of your camera. This may be the usual 3:2 of 35 mm full frame cameras, or it can be 5:4, 6:7, or even 3:1 in the case of panoramic cameras. It is easy to overlook this kind of restriction—some pictures may look better with an alternative format.

In just the same way, the fact that you have a rectangular picture is also a design choice—pictures need not be

rectangular. If it is seen in this way, the possibility of cropping to many different shapes becomes apparent. Oval cameo portraits used to be popular, for instance, and many head and shoulders shots can be given an old world elegance by cropping to an oval shape. An action shot, on the other hand, may be given more tension by the use of a triangular format.

With the standard format, correct cropping can be equally valuable. The positioning of subject matter within the frame, and its relationship to the frame edge can have an enormous effect on the picture and its meaning. The best photographers are continually aware of this. John Hilliard, for instance, has made a series of four pictures, called 'Cause of Death' from the same negative. Each picture has been cropped differently to give a totally different meaning to the image, and yet each picture is basically the same shot of a shrouded figure lying on a beach. The titles are 'Crushed', 'Drowned', 'Fell', and 'Burned', and in each case the title represents the meaning given by a different crop.

While the frame can be positioned to exclude or include particular parts of an image so as to create a certain meaning, it can also be used as a compositional device in itself. A popular picture is one which shows a scenic view framed by an overhanging branch. This is one way to use a frame within a frame, a device which gives depth to the image. The eye sees the frame as a window through which the gaze travels to find another 'window' (the frame formed by the overhanging tree). Different distances from the viewer are established in the picture, and an impression of

Man and desert *Cropping out the figure would completely destroy the impact of this picture*

Trees *Cropping in different ways creates entirely different images from the same original picture*







Ian McKinnell

more of the subject immediately outside the frame. This emphasizes quantity and power. A picture of a group of demonstrators in a large empty street makes them look rather lonely, but if you crop in close to fill the frame with them, they look much more powerful.

Once you are aware of the influence that the frame can have on your picture, you can begin to look for these effects through the viewfinder as you take a photograph. This will make it easier for you to do your cropping in the camera before the image has been decided.

The corners of the frame have a particular effect on the composition as well. A pictorial element that runs into the corner of the frame from the body of the picture gives a sense of movement, dynamism or power. Imagine a photograph of a golfer, with his club raised for action. Now imagine the picture with the tip of the club running up towards an upper corner of the frame. You can almost feel the strength and power of the shot. If you crop this sort of picture so that the club occupies the centre of the frame, you lose this feeling of dynamic action altogether.

A composition in which a visual link is made from the centre of interest to a corner of the frame is a particularly effective compositional device. Cropping can be used to move one or two of the frame edges to adjust the position of the corner. Surprisingly this method rarely works well if the link is made exactly into the corner, but is much more successful when the link just misses the corner, or stops short of the corner itself.

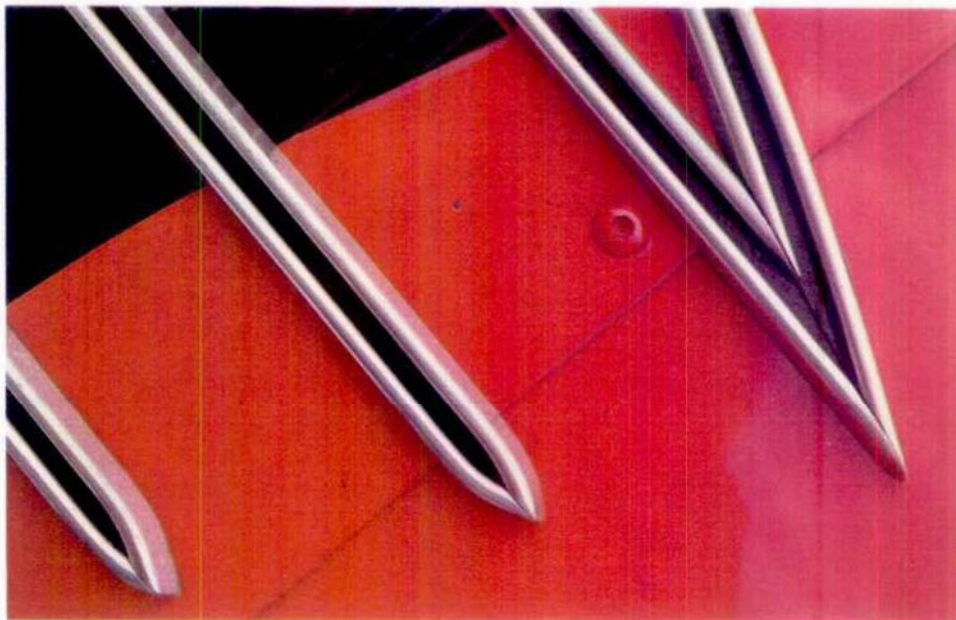
Use of the corners in this way is really a special case of the use of the diagonal line. Any line in a picture that is not parallel to the edge of the frame gives a feeling of movement within the picture. You can include more than one diagonal in this way to create a series of implied

Truck A dramatic crop to one small area of the truck gives an abstract image from a 'standard' original

depth is given. When this is used with other depth cues, such as colour and tone, a surprisingly three-dimensional effect can be obtained.

Understanding the way in which the frame plays its part in creating the illusion of space is essential if cropping is to be used as a creative tool. Although the picture of the scenic view framed with branches may have become a cliché, the same technique can be used much more subtly. A whole variety of objects can be used to frame the main subject—from bus windows to a lion tamer's hoop!

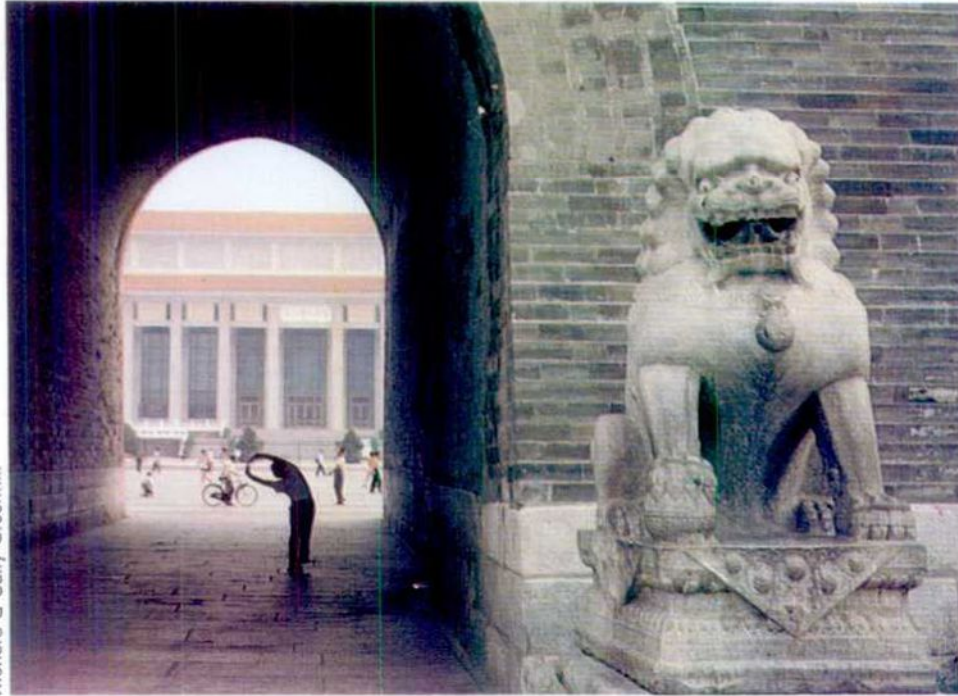
On the other hand, some subjects may have more impact if you crop the picture so that the subject fills the frame to the edges, whether you are cropping in the camera, or as an afterthought. When parts of the image are pressed up against the edge of the picture in this way, the impression is given that there is



Ian McKinnell



Archway figure
The large dark area on the left of the picture dominates the image. Cropping into the picture in this way emphasizes the shape of the lone figure within the archway



Richard & Sally Greenhill

movements within the picture. Gentle diagonals at a less acute angle are often seen in landscape pictures, where they add a lyrical quality to the image. More powerful diagonals clashing with each other give a sense of chaos and even violence to the image. However, the relationship between the diagonals and the frame is actually more dynamic than the relationship between the individual diagonals themselves. Sensitive cropping, therefore, can be used to tilt the frame slightly one way or the other in order to make the most of these diagonals.

It follows that lines which are parallel to the edge will have the opposite effect, giving a sense of stillness, solidity and strength.

Space is another component of a photograph that cropping can control. While it is always important to avoid wasted space in a picture, not all empty space is necessarily wasted space. The most obvious use of space is to convey the idea of isolation—a lone figure walking through a huge landscape, a child who seems lost in an empty street. Pictures like these need their space to work well. If you cropped to the edge of the subject, in these cases, you would lose the point of the picture. Cropping may well be used to remove

any other detail that might otherwise detract from this simplicity.

Although at first glance, there may seem to be little wrong with the framing of a particular picture, it is surprising how many pictures can be improved by cropping in a little tighter. In a candid shot of two people arguing, for instance, the original half-body shot may seem to be quite natural and pleasing, but the shot may provide a far more potent image if it is cropped in on just the head

and shoulders so that the animated expressions of the two combatants fill the frame. Many other pictures might be improved in this way, cutting out all irrelevant and distracting detail that might reduce the impact of the subject.

Remember, though, that it is easy to over crop. While cropping in close may simplify and strengthen the image, it may also cut out some important information and distort or devalue the picture. If, for example, the idea of a picture was to show George on holiday at the sea, it would be ridiculous to crop in on George and exclude the sea in the background. Pictures would also tend to look rather similar if they were all tight-cropped. There should ideally be a good balance between background information and the central subject in this kind of shot.

The exact position of the crop can be crucial. You can see the effect of cropping by experimenting on a full length portrait. Try covering up the picture gradually, judging the effect of the crop-mark—first just the feet, then the shins and so on. While information is lost as more is cropped out, the image becomes larger and simpler. Quite often, a full crop in on the head and shoulders can produce a completely different picture from the full length shot—it may even give a completely different impression of the subject—even though both approaches produce an attractive result.

The same can apply to many other subjects—landscapes, for example, can often benefit or give an entirely different image when cropped in a certain way. One thing to remember when cropping, though, is not to undervalue space in a picture. An empty space may not seem to contribute positively to the effect but without it, the picture can seem unbalanced. Try to use space as well as detail creatively.

Space can also be used to illustrate or emphasize action in a photograph. Moving objects retain that feeling of movement if they have a space to move into. A fast car, or a runner, usually photographs far more effectively when



Turkish gunman A moving subject needs an empty space to move in to

Don McCullin/Magnum

Creative approach

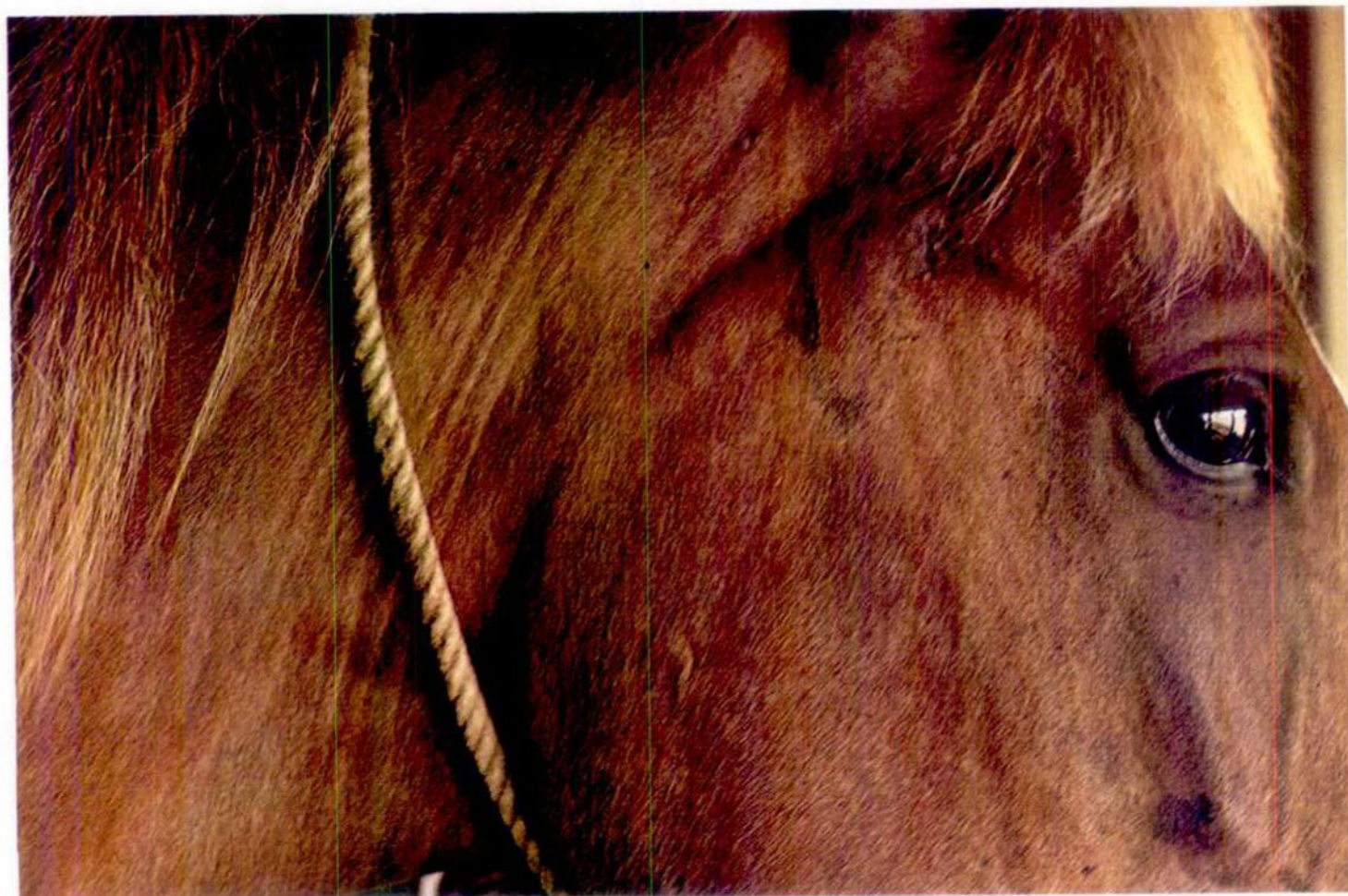
it is moving into an empty part of the frame, than if its line of movement is stopped by some other visual element in the image. Don McCullin used this technique brilliantly in his picture of a Turkish gunman running from a doorway in Cyprus. The space in this picture is given added strength since the shadow of the gunman emphasizes his movement into this bare space. There are clearly occasions when it is important for a picture to have additional space. In these cases, you must compose your photograph carefully at the time, for cropping after the event will not help.

One of the most difficult things to achieve in a photograph is a sense of rhythm. It is something that you can gradually become aware of, the more pictures you take. You can say a photograph has rhythm when it has achieved a balance between the forms and the space within the frame. In the Don McCullin photograph already mentioned, the relationship between the figure with the gun and the space he is moving into is repeated slightly differently in the relationship between the shadow and the space that it is moving into. This is further echoed behind the gunman in the way that the figure in the doorway relates to the space between the door and the gunman.

A repetition of similar, but different shapes and forms in a picture creates rhythm. Sensitive cropping can often be used to adjust the spaces or forms slightly, so as to enhance the rhythm in a picture or to remove something that



Richard & Sally Greenhill



John de Visser

The process of cropping

The essential tools of cropping are fairly straightforward. You will find it helpful to use two L-shaped pieces of firm card, preferably black. The two pieces together create a boxed-in area in which you can compose the picture you want, excluding something distracting, or an empty area that contributes nothing.

While it is relatively simple to eliminate part of a black and white print, either by cutting off the cropped out area directly, or by cropping it off in the enlarger when you make another print (see page 434), it is more difficult to crop a transparency. You can use masking tape over the cropped out area, or you can buy a masking frame of a more interesting shape. Alternatively, you can have a duplicate transparency made which includes only the needed area. Until recently, this was best left to a specialist colour laboratory. Now attachments can be fitted to the camera to make duplicate transparencies with a zoom principle (see pages 726-730). The original slide is put into the duplicator and the camera focused on it. The zoom lens on the duplicator is adjusted so that the portion of the original which is not required is zoomed out of the viewfinder, and the new duplicate contains only the enlarged area of the picture which is needed.

Fishing Here, a third figure was cropped out to improve the balance

Bjorn Borg The strong diagonal lines give a sense of dynamic action, while tight cropping emphasizes the service

detracts from it. Used well, rhythm gives life and freshness in a picture.

Composition, therefore, is simply the art of arranging the elements of the picture—shapes, lines, tones and colours—in a pleasing and orderly way. In most cases a well-organized picture is not

Horse A subject can often be depicted more dramatically if you crop right down to one strong feature

Country garden Some pictures work best when the subject fills the whole frame



Leo Mason



Trevor Wood

only more satisfying to look at, but it is much easier to understand. In a way, cropping after the exposure has been taken is an admission that you did not get the picture right first time, but only a purist would reject the improvement in strength and elegance that creative cropping can bring to those 'near misses'.

Only a few pictures out of the billions of exposures made annually become great pictures. While they may well be created because someone has been in the right place at the right time, they become great pictures because every element in the picture is important, and nothing is included which is not essential—cropping whether in the viewfinder or later, has been effective. It may well make all the difference to one of your pictures.



Equipment file

Colour processing equipment

The basic equipment needed for making colour prints at home need not be expensive, and if you choose to use colour processing drums rather than trays most of the work can be done in the light

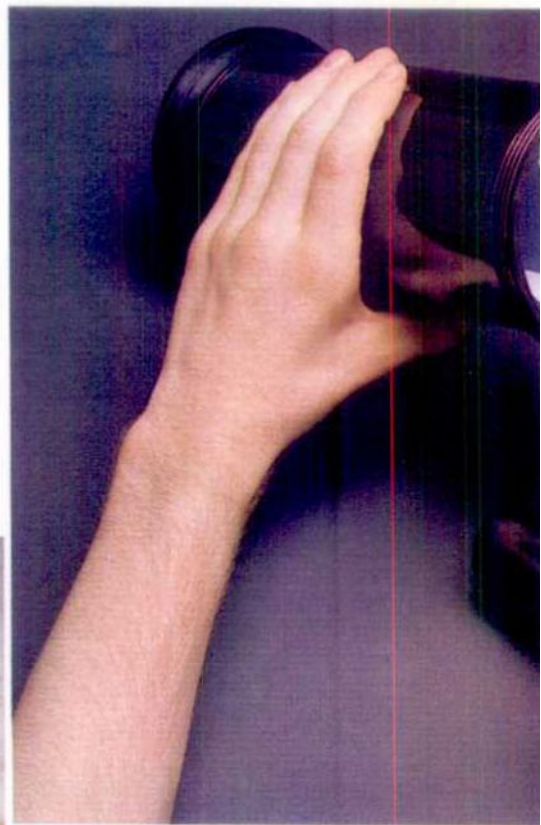
Processing colour prints at home used to be considered too difficult for all but the most dedicated amateurs. Modern equipment, together with less temperamental chemical processes, has now made colour processing almost as easy as black and white. Indeed, in some respects, making colour prints can be even easier than black and white—provided you choose the most suitable equipment.

Roll your own

There are different sizes of drum. Some are revolved by turning a handle. Other, smaller drums, are rolled by hand

While black and white prints can be processed in simple open dishes, more elaborate equipment is generally required for colour printing for a number of reasons. First of all, because there is no good safelight for colour paper, processing has to be performed in almost complete darkness—moving a print from dish to dish would be awkward and messy. Second, colour printing needs a degree of precision in temper-

Loading the drum *Curve the print slightly and push it, emulsion inwards, into the drum. Print dividers allow you to load two prints. You must load the drum in total darkness*

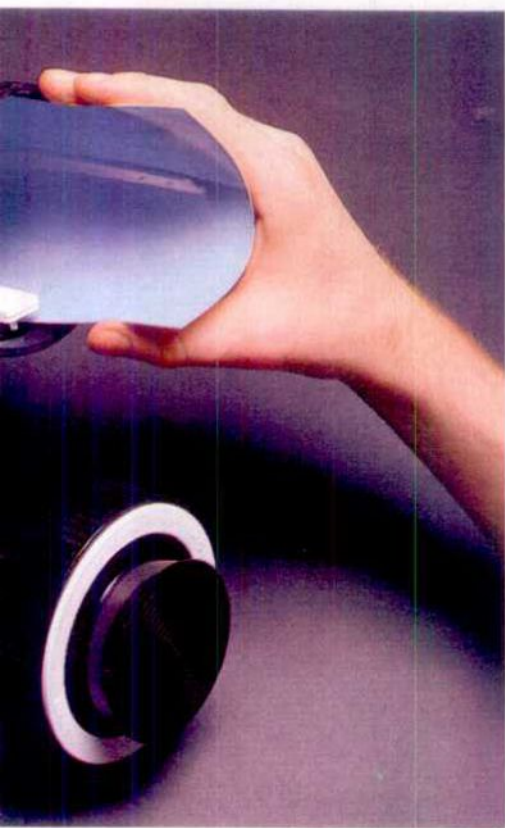


ature control that would be difficult to achieve with open dishes. Third, colour print processing chemicals will oxidize rapidly in open dishes, releasing unpleasant fumes into the confined atmosphere of the darkroom and making it difficult to maintain the chemicals at the precise concentrations needed.

The simplest and most popular solution to these problems is to use a special print processing drum, though there are other more expensive and elaborate alternatives.

Processing drums

Like film developing tanks, colour print processing drums are light-tight cylinders, usually made from plastic, with a



Dismantled drum It is important to be able to take a processing drum apart easily so it can be thoroughly cleaned and dried between sessions

special opening at one end that allows chemicals to be poured in and out without light reaching the print. Once the print is rolled up and laid around the inside of the drum and the lid screwed on, the whole process can be performed in normal room lighting using just enough chemicals to cover the print. Until the moment the solutions are used, they can be kept covered in containers in a water bath, minimizing oxidation and making precise temperature control much easier.

There are two main types of drum available. One type is filled with chemicals while in a horizontal position. This type of drum usually rests on short legs while the chemicals are poured in. The print inside the drum is fitted around the inner wall in such a way that the chemicals form a small pool between the ends of the sheet of paper while the drum is resting on its legs. Processing begins when the drum is rolled across the workbench, allowing the chemicals to flow

over the surface of the print. The second type is loaded vertically and has a cup under the lid of the drum that holds chemicals. When the drum is tipped into a horizontal position it allows the chemicals to flow out of the cup and over the print.

Both horizontally and vertically loaded drums use relatively small amounts of chemicals, which are thrown away after each print is processed. This ensures that the concentrations of the solutions are consistent. Prints are agitated and kept immersed in the processing solutions either by rolling the drum manually back and forth along the workbench, or by using a motorized drum roller. This constant agitation usually gives very even results.

Generally, however, the vertical drums are slightly easier to use because they can be filled with water for prewarming the drum. With horizontal drums, water may slop out of their narrow filling spouts as they are being filled.

Some drums have ribbed inner walls. This is an advantage because it prevents chemicals from being trapped behind the print, which may cause staining and contaminate subsequent solutions in smooth walled drums. The best drums are those which can be completely dismantled for cleaning after use.

Most drums can hold more than one print at a time, and have movable dividers that slot into the drum walls to prevent prints from sliding over each

other. This is a considerable advantage, since it means that two or more prints can be processed as quickly as one. It is usually best to buy as large a drum as you can afford, although it can be expensive to process only one print in a drum designed to take chemicals sufficient for four prints.

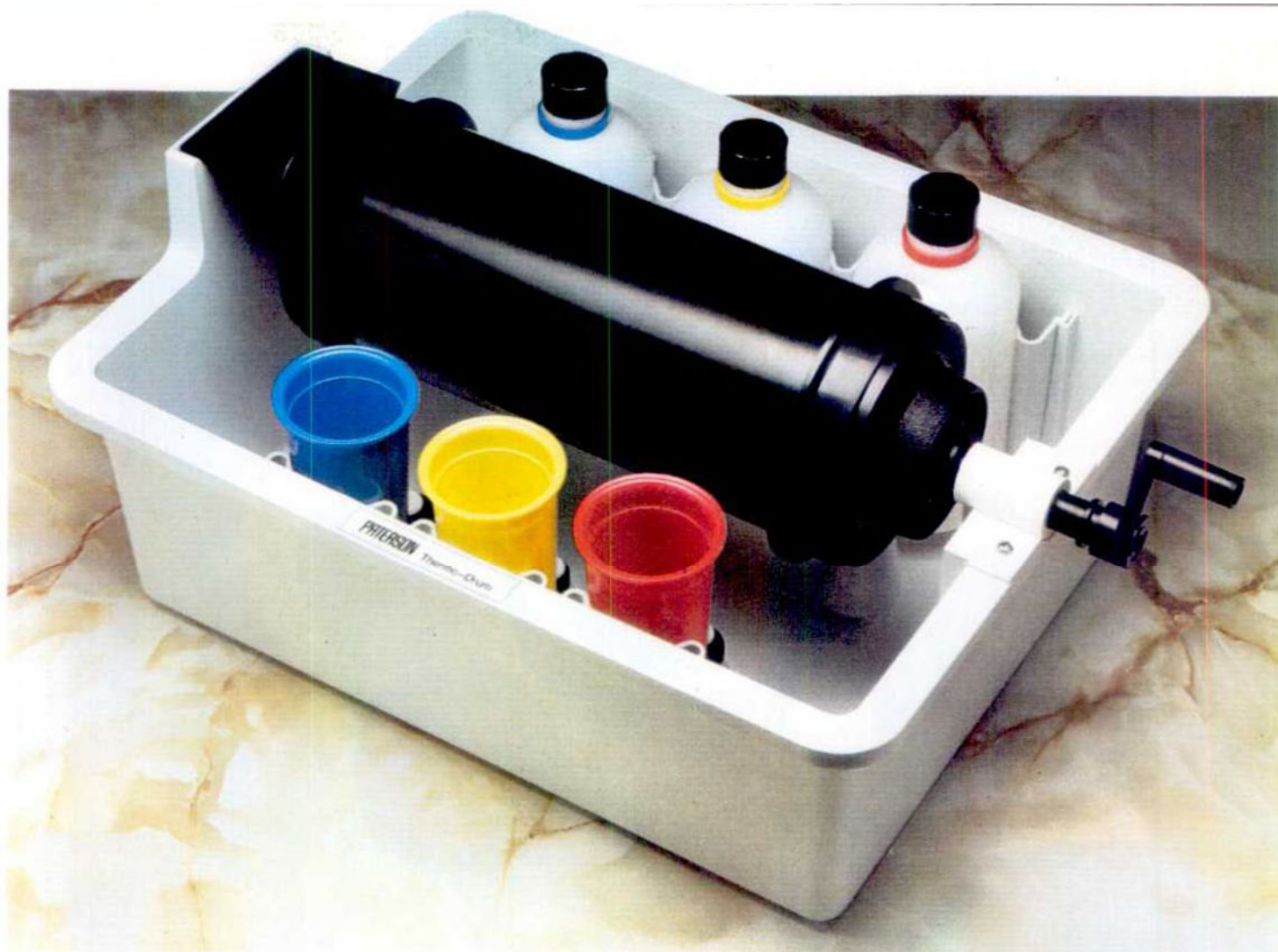
Extra equipment

Although processing drums are simple to use with little additional equipment, there are various accessories which can make print processing much easier, particularly when making large numbers of prints.

One of the most useful extras is a motorized drum roller. After the initial excitement of making your own colour prints has worn off, you may find that manually agitating a processing drum is extremely tedious—dull enough to pose a threat to the consistency of your processing. Motorized drum rollers remove this tedium.

They are available in several different types. The simplest is the plain roller base that spins the drum on its horizontal axis. Some of these turn the drum in only one direction; others have eccentric rollers that rock the drum slightly while it turns, giving better agitation. Perhaps the best are those that incorporate a reversing motor that automatically turns the drum first in one direction, then in the other.

To save warming the drum before



Jon Bouchier/equipment courtesy of Paterson

Colour processor This has its own tempering bath which you fill with hot water to keep the solutions warm while turning the drum with a handle

Motorized drum This processor can also be fitted with a battery-powered motor which saves you the trouble of turning the drum manually

each print is processed and to ensure accurate temperature control throughout the process, you can also use special drum rollers that incorporate a thermostatically controlled water bath. The drum is rotated in the machine while partially immersed in the water bath. There is usually a section of the bath into which chemical storage bottles can be placed to ensure that they too are at the correct processing temperature. These machines are expensive, but give excellent results. Separate temperature control units solely for chemicals are also available. These are known as *tempering boxes* (see page 549). Most use water baths, but one unit heats the chemicals with a hot air fan. Tempering boxes are not strictly necessary, but some printers find them very useful.

One device you can use to make colour processing much easier is a programmable timer. These are usually simple clockwork minute timers with dials into which small plastic markers can be slipped. As each marker reaches an index mark, a bell is rung reminding you to pour out one solution and move to the next processing step. More expensive electronic timers are also available, some of which can be connected to a drum roller so that processing is automatically halted at the correct time.

Other approaches

While drums are ideal for amateurs who work on a small scale, they have a number of drawbacks for processing large numbers of prints or single large prints. If you need to process a large number of prints quickly, for instance, it is a chore to have to clean and dry a drum thoroughly after each set of prints is processed. The dividers that hold prints apart in drums may also cause very slight unevenness in processing at the edges of prints, and this can only be trimmed off after the print has dried. Extracting wet prints from a drum at the end of the processing sequence can cause damage to the delicate wet print emulsion, particularly if you are in a great hurry.

One solution to the problem of limited drum size is simply to use a larger drum. Drums intended for the small scale user usually start at print sizes of 20 × 25 cm and go up to about 40 × 50 cm. Very large drums up to 60 × 80 cm are available, but these are moving away from the simple drum principle. They take a large number of smaller size prints, are mechanically driven, have thermostatic control of solutions, temperatures, and even include automatic chemical emptying.

For semi-professional printers, the





Jon Bouchier/equipment courtesy of Jobo



simplest alternative is a *deep tank* processor. In principle, these are very similar to dishes, but without some of the disadvantages. Deep tanks of solution are held at a constant temperature by a thermostatic heater. Exposed sheets of paper are loaded on to hangers and placed in the tanks. Oxidation is reduced by the small surface area of the chemicals exposed to air.

These units need to be used in total darkness, but since they are compact and easily manipulated, this is not too great a problem. They are particularly suitable for use with Cibachrome, since normal room lighting can be turned on halfway through the second processing step (the bleach) without noticeably affecting the results. Chemical concentrations are maintained by replenishment—adding a small quantity of fresh solution to each tank after each processing run. Floating tank lids prevent chemicals oxidizing when the unit is not in use.

Roller processors are a more sophisticated method of print processing usually only found in professional darkrooms, though there are a few small roller processors suitable for home use. They consist of a motorized unit incorporating temperature control and usually some means of automatic chemical replenishment that transports exposed printing paper through a series of rollers and into chemical baths. Exposed prints are simply fed into a slot at one end of the machine and removed fully processed from the other end a few minutes

Built-in motor Some sophisticated processors have a built-in motor and thermostatically controlled water bath to keep the temperature steady

later. A continuous stream of prints can be produced with little effort, once the machine has been set up. Their main disadvantage is their complexity and they have to be carefully taken apart and cleaned after each printing session. Roller processors that handle prints from negatives cannot usually be adapted to making prints from slides and vice versa. The main drawback for the amateur, however, is that even the smallest roller processor is very expensive.

Other approaches to colour print processing have been tried in the past, such as laminar flow processors, which run a thin film of processing solution over the surface of the print, and the 'Colour Canoe', which was an intermediate stage between dishes and drums.

An alternative method that may one day rival the supremacy of the drum in the small darkroom has recently become available. This is the Kodak Ektaflex Print Making System which uses instant picture technology to make prints from slides or negatives with only one processing machine. However, at present, this system only works with Kodak products and is relatively expensive. For the present, the colour processing drum is still the simplest and most economical way of making prints from your colour slides and negatives.

Jon Bouchier/equipment courtesy of Paterson

Improve your technique

Copying pictures

By carefully photographing a painting, drawing, or faded photograph, you can produce transparencies of it for projection, or any number of identical copies in colour or black and white

High speed photocopiers have made document copying completely routine, but even the best electrostatic copiers leave much to be desired when it comes to the reproduction of pictures. Paintings and old photographs still need to be rephotographed in order to provide a reasonable facsimile. Good copy can sometimes be achieved by using a hand-held camera on its closest focus outdoors, but there are many things that can go wrong. Much better results are possible if you take care and work in a methodical way.

The major barrier to good copies is the format of the film, because some detail is always lost when the image on the film is much smaller than the original in front of the lens. As a general rule, you should use the largest film size possible—even a cheap roll film camera is preferable to any 35 mm camera. Small format cameras are capable of acceptable results, but you must take extra care when using them, particularly with exposure.

The camera must be held absolutely rigid, with the film exactly parallel to the original subject. A tripod or special copying stand makes this much easier. The subject matter must be evenly lit, and if you are using colour film, the colour temperature of the light source must be matched to the film in use. Finally, all the criteria of normal photography apply—focusing must be correct, and the exposure must be precise. If all these precautions are observed, and the resulting film is processed, then projected or printed with care, the copies will be as close to the original as they can possibly be.

Equipment and lighting

There are two types of copying set-up—vertical and horizontal. In a vertical arrangement, the camera is supported with its lens pointing vertically downwards, and the original to be copied is laid down flat below it. You can buy special copying stands, which support the camera on a vertical rail; but these are not essential. If your tripod has a reversible centre column, you may be able to use this as a camera stand, though the legs often get in the way of the copy lights. If your enlarger can be adapted for use as a copying stand, this may prove ideal, and almost as good as a purpose built unit.

A vertical copying set-up is most useful for fairly small originals, because with larger ones, the separation between the camera and the original is



Horizontal copying If you do not have a copying stand, or if your subject is too large to be copied from above, pin it on a flat wall square to the camera

limited by the length of the column on the copy stand, or, ultimately, by the height of the room in which you are working. You may not be able to get far enough away from a big original. For macro work, such as systematically copying a stamp collection, a vertical copy stand is ideal, because you can arrange to work sitting down, which is more comfortable over long periods. Copying from books is also easier using a vertical stand, as the pages are easier to hold flat when they are horizontal.

If you are photographing originals bigger than about 80 cm wide, horizontal copying is simpler. Here, the original

is fixed to a wall or any other vertical surface, and the camera stands on a tripod pointing at it. Since the camera can be moved a long way back, an original of virtually any size can be copied, as long as the lens of the camera remains at the same height as the centre of the subject.

Whichever system you opt for, use the largest size of film, and the best lens that you can. Most modern standard lenses—even quite cheap ones—are of remarkably good quality, and are suitable for copying at normal distances. Wide angle and zoom lenses are definitely not suitable, and though most

Dave King



Colour control A grey scale and a set of colour patches make printing easier when you are copying in colour



Grey card For accurate exposure regardless of subject tones, take a meter reading from a standard grey card

telephoto lenses give good enough quality, they force you to move a long way back from the subject.

For copying originals smaller than 20 cm wide, you need special close-up equipment (see pages 404 to 407). Avoid using a macro zoom lens, or close-up supplementary lenses, both of which give slightly unsharp results.

One of the greatest problems encountered when copying, particularly where there are glossy-black areas on the original, is that of reflections from the surface of the original. The room in which the copying is to be carried out

should ideally have non-reflective walls and ceiling to prevent flare, reflection and colour distortion, but few houses have a totally black colour scheme. The most practical alternative is to surround the original with black or grey card, and to use a room that does not have very bright colours in it. Remember that brightly coloured clothes can reflect unwanted colour casts into a copy.

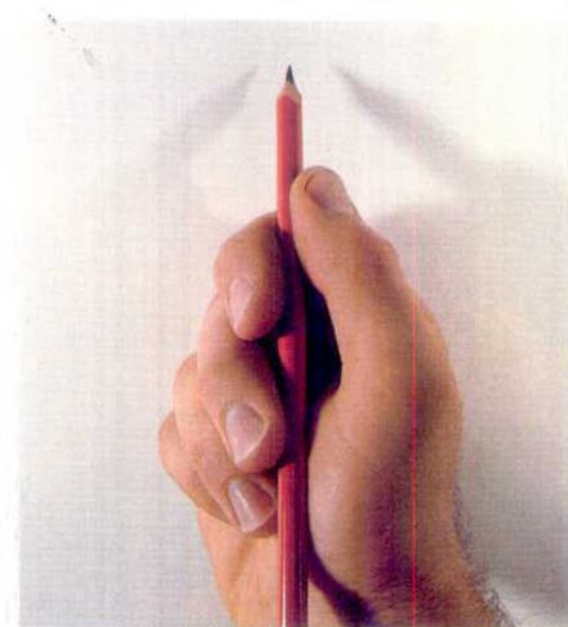
Try and cut out daylight illumination by drawing curtains or blinds, or else wait until the sun has set before starting work. While you are actually making exposures, turn off all the room lights so

that the copy lights themselves are the only source of illumination.

Any even, consistent source of light can be used for flat copying. Daylight is not generally consistent enough, because it varies in direction, brightness and colour, and the two major alternatives—tungsten and flash—are much more suitable.

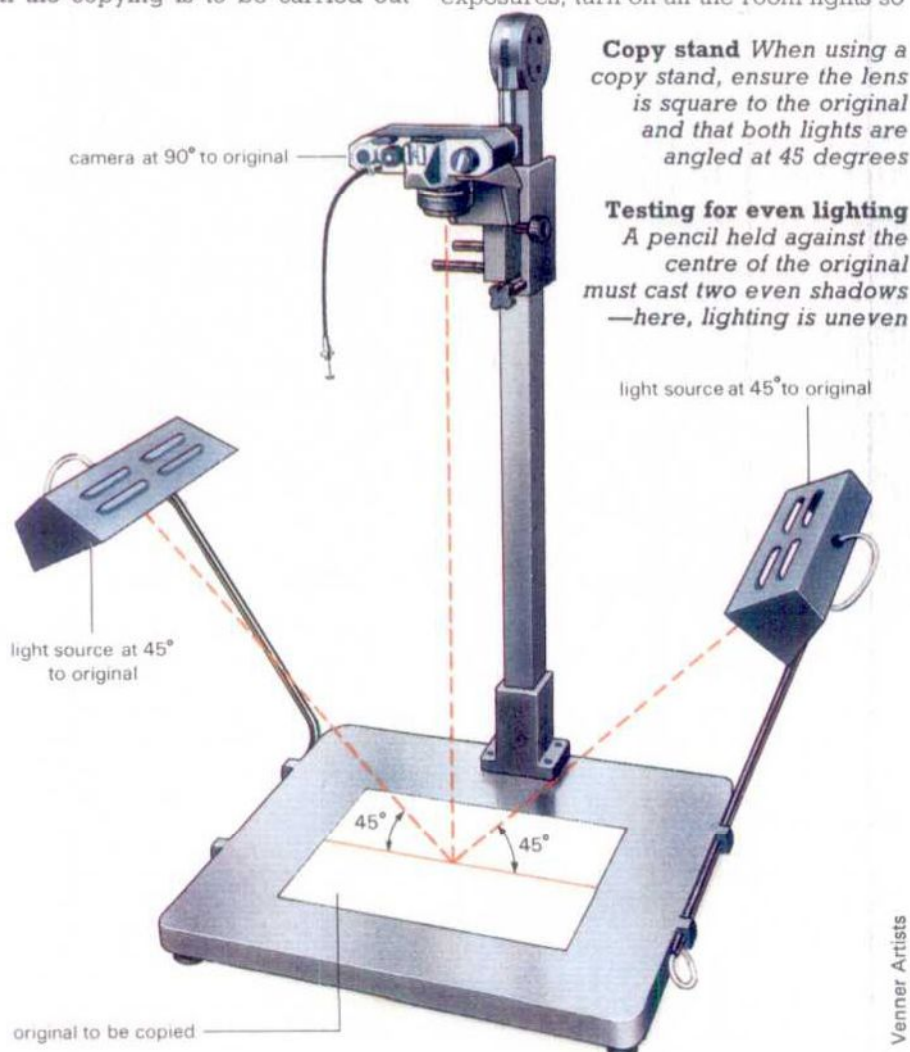
Tungsten lamps are the most convenient source of light, because the reflectors, stands and bulbs are cheap to buy, and can be easily controlled. Two 500 W photoflood or photoparl bulbs give sufficient light for all but the largest originals. They should be placed at 45° to the subject, and on a level with it. The lights should not be too close to the subject, or the illumination will not be sufficiently even. The minimum practical distance depends on the lamps and reflectors, but as a rule of thumb, do not put them closer than two or three times the width of subject to be copied.

When you have set up the lights, test



for evenness of illumination by placing a pencil in the centre of the original, standing up at right angles to it. The shadows that it casts should be of equal density, and the same length. The two light sources should light the original as evenly and completely as possible, and you can check this by turning each light on individually. The pool of light thrown by each lamp should be centred over the subject, and should not fall off towards the corners or edges.

Although it is slightly more difficult to use for copying than is tungsten, electronic flash is in some ways a better light source. It does not give off any heat, and it can be used with daylight colour film. A small flash unit can give off a very powerful burst of light, and the short duration freezes any camera movement that the tripod has not eliminated. On the other hand, however, it is difficult to set up a flash-illuminated copying stand unless the units have a modelling light to indicate the illumination. So tungsten lighting is simpler



unless you plan to do a lot of copying and can afford sophisticated studio flash units.

Although fluorescent tubes can be used for copying in black and white, they are too low in power to be of much practical use, and give a green cast when used with colour film.

Film and exposure

The most suitable type of film depends on what you are copying, the light source you are using, and the final use to which you plan to put the copy—is it for projection, or do you want a print?

If you want to produce a copy in colour from a colour original, it is best to use transparency film, whether you want to print or project the copy. Ordinary colour negative film can be used to get a rough copy print, but does not give as good results as colour transparencies. Professional colour copies for printing are shot on special internegative film,

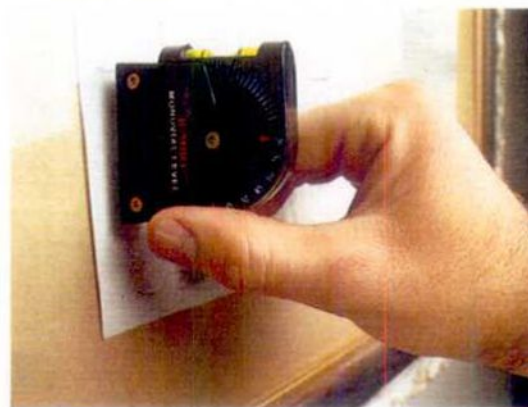
but to use this effectively you need an expensive densitometer—a sophisticated laboratory instrument. It is more practical to load your camera with colour slide film, then make reversal prints.

For copying using tungsten light, if possible use a slow tungsten balanced film such as Ektachrome 50 Professional—but bear in mind that this must be kept refrigerated before and after exposure for the most consistent colour. If you are using electronic flash to illuminate the original, use any slow daylight type film. Kodachrome 25 gives the finest grain of all films, but processing involves returning the film to Kodak.

If you are going to make prints from the slides, it is worth buying a set of printed colour patches, and a grey step wedge. Include these at the extreme edge of the frame, within the picture area, when taking the pictures. They will appear in the final print, but can be easily trimmed off. The purpose of these



Pictures under glass Prevent reflections from a glazed original by covering the camera with a black cloth or card



Pictures on the wall If a picture does not hang vertically, measure its angle and keep the camera parallel to it

patches is to provide a standard reference for colour balance and exposure at the printing stage. When the printer does not have access to the original subject, they make it much easier to judge when colour balance is correct.

In black and white, the type of film you should use depends largely on what you are photographing. All colour originals should be photographed on to fine grain panchromatic film such as Panatomic-X, but black and white originals may need special treatment. They can be divided into two groups—line, and continuous tone.

Line originals consist of solid black areas and clear white paper, with no shades of grey in between. Into this category fall engravings, pen and ink drawings, pages of type, lettered manuscripts, and in fact anything in black and white which needs to be reproduced at high contrast. Newspaper illustrations are made up of a coarse dot pattern, and are usually regarded as line material. These originals should ideally be copied using line film, or lith film such as

Special problems

When your original is perfectly flat, in good condition and non-reflective, you should have no difficulty in copying it. Unfortunately, few originals are that simple, and you may have problems with certain types of subject.

Glass You may sometimes need to copy a subject behind glass. This is not easy, because glass is slightly green in colour, and can reflect the camera and copy lights. To get round these problems, position the lights so that they illuminate the original at a more oblique angle, and do not illuminate the camera lens. Take great care, though, that illumination still remains even.

The reflection of the camera can be eliminated by cutting a hole in a large sheet of black card or material, and poking the camera lens through this. Watch out for your own reflection, too.

You may not notice the green colour of glass at the time of exposure, but to prevent it colouring your copies, use a light magenta filter over the camera lens. Five units of colour correction is a good starting point to begin practical tests.

Copy not flat Bent or curved originals can sometimes be held flat using drawing pins to hold them down to the copy board, but if this fails, try holding them flat overnight under books. If this does not work, dry mount the originals on heavy board. As a last resort, hold them flat under glass, but pay attention to the comments above.

Books If you have to copy a book, use a vertical copying stand, and support the cover at one side with another book, or a foam block. Use a rubber band to prevent the pages from flicking over. If it will still not stay open flat, weight it down with a sheet of glass, but again, beware of reflections.

Stains and fading Old photographs are frequently marked with dark or pale stains. There is no way of removing them if you are making a colour copy, but in black and white you may be able to filter

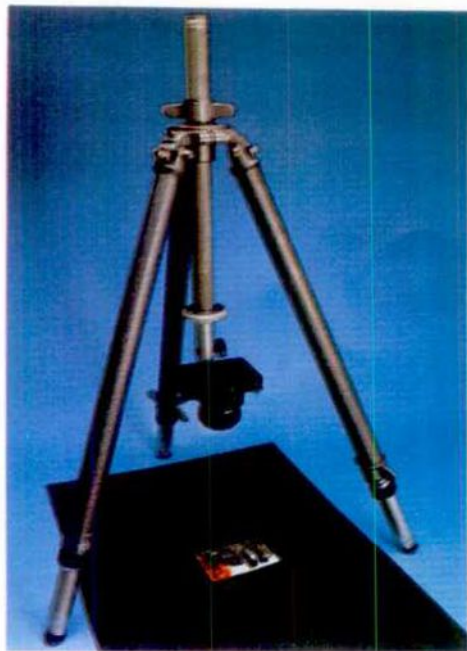
them out. If the stains are yellow on a pale area, they can be eliminated by a yellow filter on the camera lens. If there is yellowing in a dark area, a blue filter can sometimes be used to darken this. The general rule for black and white film is that a coloured stain can be eliminated by a filter of the same colour, and darkened by a filter of a complementary colour. Remember that filters lengthen the exposure time.

Paintings hanging on a wall It is rare to find a painting that hangs parallel to the wall. Either wedge the bottom of the painting until it does, or tilt the camera until the film is parallel with the canvas. This is made easier by using a clinometer—an instrument that allows you to match the slope of the painting and camera.

Non-SLR camera If your camera is not an SLR, the taking lens sees a different view from the viewfinder. Before putting film in the camera, open the back, and put a small piece of tracing paper over the film gate. When the lens shutter is set to 'B', an image of the original is projected on to the paper, and you can adjust framing from this image.

Uneven reflective subjects Oil paintings that have a glossy uneven surface can be very difficult to copy, because each ripple of paint picks up a bright highlight. The only certain solution is to use a polarizing sheet filter over each copy light, and another polarizing filter over the camera lens. If the plane of polarization of the filters on the lamps, and that of the filter on the lens are at right angles, all unwanted surface reflections will be cut out.

There are several disadvantages to this system—tungsten lights get very hot and can burn the filters, a considerable amount of light is soaked up by the polarizing sheets, and the cost of the polarizing material itself is high. Try and avoid resorting to polarizing filters if at all possible. The principle of eliminating reflections using polarizing filters is described in detail on page 1030, but the effect is visible through the lens.



Vertical copying You may be able to reverse your tripod column and use it as a vertical copy stand

Eliminating stains The original of this picture was spoiled by ink marks. Copied in the normal way, this showed up as a dark stain, but with a red filter fitted over the lens, the mark was eliminated from the copy print



Kodalith. If it is processed correctly—as shown on pages 914 to 917—this film reproduces everything as either black or white, and completely eliminates grey tones. While lith film is available in 35 mm form, other high contrast line films are only available as sheet film. For occasional copies, it is possible to cut thin strips of sheet film and to load them into the camera individually.

Instead of using line film you can use conventional film, and increase development to raise the contrast level. Printing on hard paper further increases the contrast.

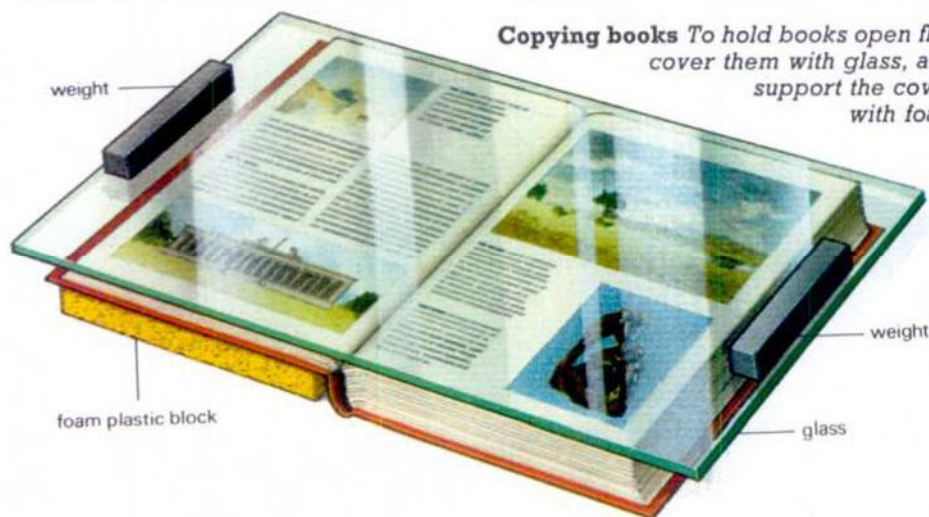
The term continuous tone covers all other black and white subject matter and includes everything that has shades of grey which must be correctly reproduced. Photographic bromide prints are continuous tone, as are drawings, quality book illustrations, pencil sketches and so on. All this material can be copied effectively on ordinary fine grain film.

If you want to project your black and white copies as slides, you can either use a special reversal film such as Agfa Dia-direct, or, if this is not available, use ordinary fine grain film and reversal process it (see pages 978 to 980).

Whichever film you use, exposure metering is always done in the same way—either take an incident light meter



Copying books To hold books open flat, cover them with glass, and support the cover with foam



reading with a separate hand-held meter, or place an 18 per cent grey card on the original, and take a reflected light reading from this using your camera's TTL meter. Always bracket your exposures to make sure that you get one exactly right—this is particularly important with line and slide film.

Contrast tends to rise in copying, and for black and white you may need to adjust the exposure and development in order to retain all the details in the final copy. Trial and error is the only way to determine what changes are necessary, but a good starting point is to give one stop extra exposure, and cut the development time by a quarter.

Venner Artists



World of photography

Bringing home the world

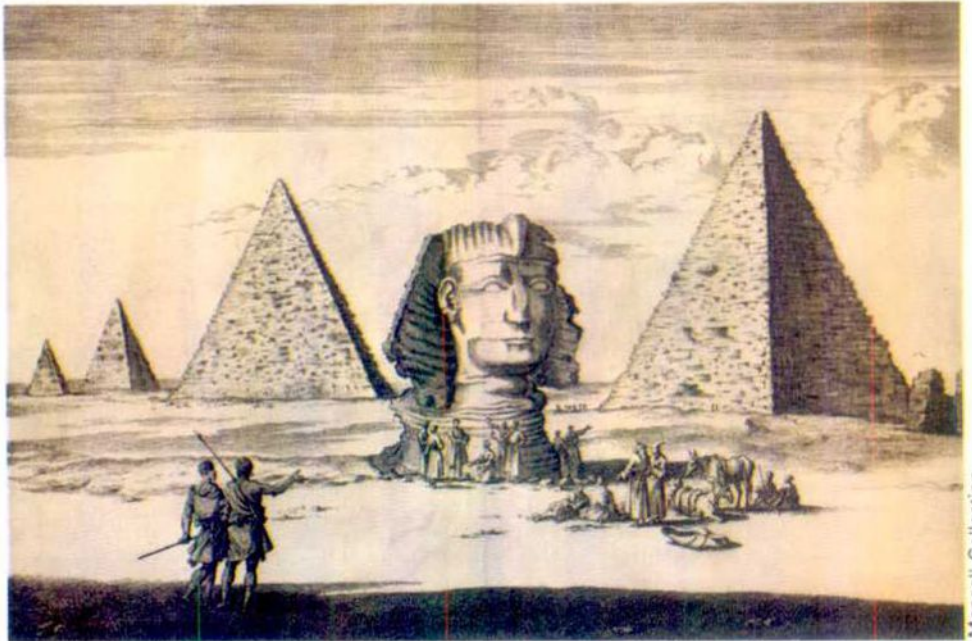
In the mid 19th century the growing middle classes were eager to see pictures of faraway lands and other cultures. This was to be satisfied in a new and exciting way by the emergence of the travelling photographer

Most people today are familiar with scenes from foreign lands. Television and magazines constantly supply images from around the world, so that everyone is accustomed to seeing steamy jungles, parched deserts and icy waters.

Yet in the 19th century, such sights were unknown to the vast majority of people. To slake the public's insatiable thirst for knowledge of what the world was really like, a new breed of photographer was born—the globetrotting travel photographer.

Before the invention of the daguerreotype in 1839, there was a thriving trade in topographical drawings. These popular prints were often highly inaccurate, being based on little more than 'travelers' tales' and the artist's imagination.

Photography, by contrast, created a sense of wonder with its lifelike appearance. The Victorian public could at last be offered convincingly realistic glimpses of far flung places, foreign



Mansell Collection

The Sphinx and the Great Pyramid, Egypt Francis Frith's photograph (below), taken in 1857, shows the absurdity of the more fanciful artists' impressions that were produced before the advent of photography



Family viewing Looking at stereographs became such a popular pastime in late 19th century England that it has been described as the 'Victorian television'

Francis Frith/Mansell Collection





peoples and their customs.

Seeing a photograph of a place was almost the same as experiencing it in person. 'On looking at these pictures, one can imagine ones self among the hills and mines of California, gasping at the glittering gold that lies before you', said one commentator on the daguerreotypes of Robert H. Vance.

Many of those who could afford to travel used the daguerreotype in place of the sketchbook. The writer John Ruskin was one of these. Speaking about another daguerreotype he had bought in Venice he said: 'With 200 francs I bought the Grand Canal from the Salute to the Rialto; and placed it away in thoughtless triumph.'

But although daguerreotype photographers travelled all over the world, their work itself could not be widely distributed. The daguerreotype process produced only a single positive image, and did not lend itself to mass reproduction. But hand-drawn copies, with people and other details often added, were reproduced by the aquatint and wood engraving process, offering much greater realism than the previous artists' impressions.

Early efforts tended to concentrate more on architecture and landscapes as these were best suited to the long exposures required. Burdened with equipment, the first travel photographers recorded the pyramids of Egypt, the spectacular American West, and views of

Himalayan landscape Samuel Bourne took this magnificent scene in 1866 during his third trek to the Himalayas with a vastload of chemicals and equipment

Photographing the frontier The small boat in the foreground was used by O'Sullivan during his extensive travels through America after the Civil War



Timothy O'Sullivan/courtesy George Eastman House





Tlingit Indians *Muybridge's photographs of the north west coast Indians are some of the earliest ethnographic pictures ever taken in this area*

the Parthenon and the Alhambra, a Moorish palace in Spain.

Europeans felt a particular fascination for Africa and the East, and especially for those countries with biblical or colonial connections. The imperial concerns and attitudes of the photographers and their audience were often clearly reflected in the resulting pictures—making them unique documents.

One of the first photographically illustrated books, which used the calotype process, was *Egypte, Nubie, Palestine et Syrie* published in 1852, with photographs by Maxime Du Camp. Together with the writer Gustave Flaubert, Du Camp was commissioned to record the monuments of the Near East. Travel was a hazardous business at the time. Just before they left Du Camp found Flaubert sobbing 'I'll never see my homeland again!' However, they returned safely, and the book was a great success.

As landmarks became more familiar, and photographic equipment improved and became easier to use, the photographer-explorers began to look more closely at people and their customs. Toe nail clipping in China, the women of Morocco, South American Indians and details of daily village life in Russia found their way to the Victorian parlour.

The stereograph became the rage, as the drama of landscape was enhanced by its three-dimensional effect. It sold in millions from the 1850s to the 1890s on both sides of the Atlantic.

Most photographers made stereo pictures as well as larger images and some carried several cameras to produce the same view in different formats. Lantern

Physic Street, Canton, China *One of the illustrations that John Thomson used in his book 'China and its People'—the result of several years travel*



slides were also extremely popular later, particularly for public lectures.

One early successful English travel photographer was Francis Frith. *The Times* described his photographs of the Holy Land as 'the most important ever published.' These views were the first of the area to be widely seen in England, and appeared in the first photographically illustrated Bible. Frith made three journeys to Egypt, Palestine and Syria, and, on the last one in 1860, travelled farther up the Nile than any previous photographer—2500 km by horse and camel.

Frith used the wet plate or collodion process which was much better suited to landscape and topographical work than either the daguerreotype or the calotype. Exposures were much shorter, and the glass negative produced a finely detailed image. Most important, the process had commercial potential, which Frith exploited by later becoming Europe's largest publisher of photographic views. He also established an extremely successful firm producing postcards.

The wet plate process, however, did have its disadvantages for the travelling photographer, some of which were ruefully described by F. S. Dellenbaugh who accompanied Major John Wesley Powell on his exploration of the Grand

Eadweard Muybridge/Science Museum, London

John Thomson/The Royal Geographic Society, London



Street scene, Constantinople Robertson took this picture of the Imperial Gate of Seraglio in about 1855 while travelling through Turkey with Beato

Lao village, Siam Thomson took this picture on a six month trip through Thailand to Cambodia (Kampuchea) in 1866 photographing the land and people



John Thomson/The Royal Geographic Society, London

Canyon in 1871: 'The camera in its strongbox was a heavy load to carry up the rocks, but it was nothing compared to the chemical and plate-holder box, which in turn was featherweight compared to the imitation hand organ which served for a darkroom. This dark box was the special sorrow of the expedition, as it had to be dragged up the heights from 500 to 3000 feet.'

Nevertheless, a surprising number of photographers were undeterred, producing magnificent pictures under the most adverse conditions in distant corners of the world. In 1861 the Frenchman Auguste Bisson was the first to take photographs from the top of Mont Blanc, the highest mountain in Europe. The expedition required 25 porters, and the plates had to be rinsed in melted snow.

Sixty porters were necessary to transport the equipment and provisions of Samuel Bourne's nine month expedition to the Himalayas. In 1866 he photographed the Manirung Pass, the highest altitude (5650 m) at which wet plate photographs had ever been taken. Of one trip he said: 'How my coolies with their heavy loads, some of them unwieldy things like tent-poles, ever contrived to get safely over this five miles of walking on a ledge, instant death staring them in the face at every step, remains a profound mystery to me'.

William Henry Jackson was one of the great American frontier photographers. Eight government geological surveys which he accompanied between 1870 and 1877 gave him ample opportunity to make unique records of virgin territory. His journal illustrates some of the problems facing the wet plate photo-



A crevasse in the Savoy Alps, 1860 By Louis and Auguste Bisson who were summoned by Emperor Napoleon III to accompany his climbing expedition through the mountains

grapher. One mountain had to be climbed three times before he could get a successful photograph. On the first day it was too windy; on the second the silver bath leaked; and it was only at the third attempt that 'everything worked lovely'. On another occasion his pack mule, Gimlet, fell and broke most of his plates.

Pack animals seem to have been a particular problem. Samuel Bourne had a similar experience, as did Powell on his Grand Canyon trip. 'The horse bearing the camera fell off a cliff and landed on top of the camera, with a result that need not be described.' Other hardships included temperatures which made chemicals almost too hot to use, 'vicious mosquitoes' and 'mountain ail'. The unfortunate early wet plate photographer Ridgeway Glover was found after he had been 'scalped, killed and mutilated' by Indians.

Although some European photographers used large plate sizes—Frith made 16 × 20 inch views of the desert—it was the Americans who pioneered the use of mammoth plates. As William Henry Jackson said of his 20 × 24 inch views of the Rocky Mountains: 'They convey an impression of the real grandeur and the magnitude of mountain scenery that the smaller views cannot impart.'

Other significant photographers of this era were the British photographer Eadweard Muybridge (see page 644) and the American Carlton Watkins, who at first were partners and later rivals.

Muybridge is famous for his work on

animal and human locomotion, but topographical photography was a brief though memorable part of his career. He published over 1500 views, including 50 'mammoth' ones. Muybridge's early views have clouds 'printed in' from a separate negative to counter the stark white skies caused by the excessive sensitivity to blue light of the early plates. Later both he and Jackson succeeded in rendering both sky and land satisfactorily on the same negative.

Watkins went to California during the Gold Rush, and subsequently won great acclaim at the Paris International Exhibitions of 1867 and 1868 for his 21 × 16 inch views of the newly discovered Yosemite valley.

John Thomson and Felice A. Beato were among the many photographers who documented the life and customs of the people as well as the landscape in the countries they visited. Beato first worked in partnership with James Robertson, Chief Engraver to the Royal Mint at Constantinople, with whom he photographed Malta, Egypt and Athens. Beato went on by way of India and China to Japan, where he produced some of his finest work. Thomson photographed extensively in several countries including Cyprus, Cambodia and China. He produced several books of text and photographs based on his travels, the best known of which are the four volumes of *China and Its People*.

Timothy O'Sullivan, a photographer in the American Civil War, was one of the most experienced survey photographers. He took part in several ex-



Timothy O'Sullivan A self-portrait of the great American landscape photographer taken during the year-long Selfridge expedition to the Isthmus of Darien (Panama) in 1870

peditions, including Clarence King's Geological Exploration of the Fortieth Parallel in 1867. One invaluable service that he performed was to record the vanishing lifestyle of the American Indians in their traditional habitat. By the 1890s they had been herded into reservations and later photographers had to recreate their settings artificially.

The heyday of landscape and topographical photography lasted a brief 20 years, the period from the 1860s to the 1880s, in both Europe and America. After this time, the introduction of the dry plate process made mammoth plates too expensive. It also made photography much easier, and as distant places became more accessible, hordes of photographers appeared, producing standardized images for tourists.

The introduction of the dry plate also heralded another revolution—the beginnings of real amateur photography. It coincided with the development of better transportation in the form of railways and steamships, while the increased affluence of the middle classes allowed them to travel and to see the world for themselves. These travelling photographers tended to record their own presence in a land rather than the land itself.

The invention of George Eastman's Kodak box in 1880 (see page 761) meant that travel photography came within the reach of anyone. Eastman himself accounted for his product's success as follows: 'Anyone who has sufficient intelligence to point a box straight and press a button could now take a picture.'

Whitewater canoeing



Wild water, dramatic action and plenty of colour are just a few of the attractions of a white water canoeing assignment

The power of a fast moving river, the skill and strength of the canoeists and the cheerful atmosphere of an international sporting event all combine to make a world championship white water canoeing event a promising photographic subject.

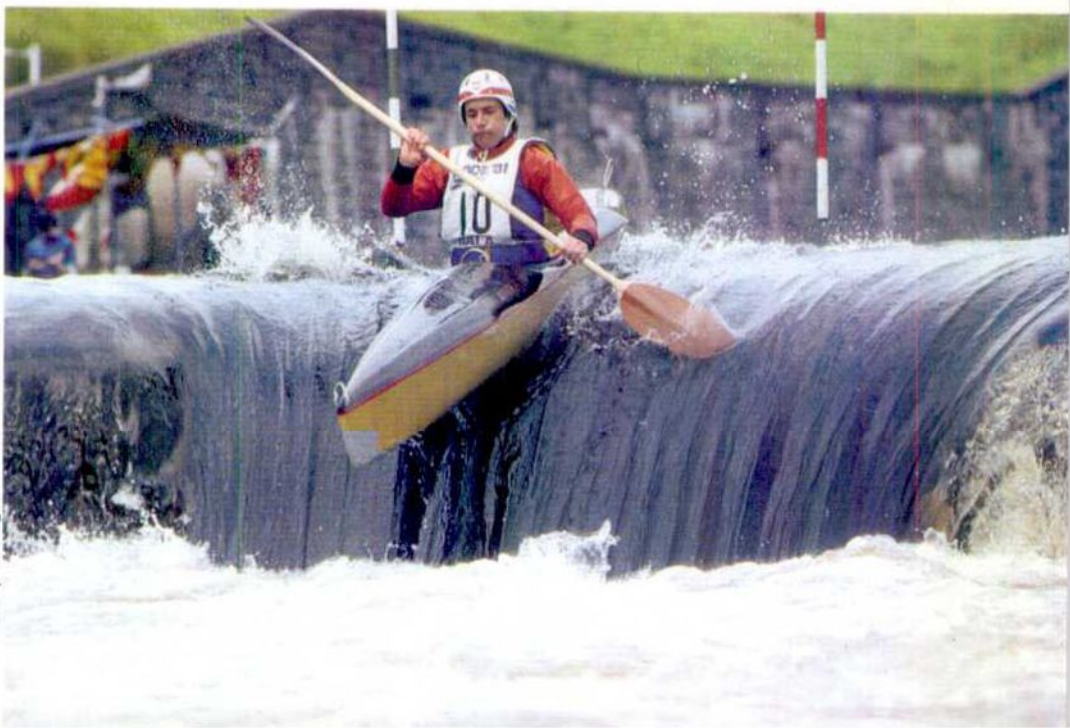
Such events invariably take place in attractive, rugged areas of landscape, so the photographer who decides to cover this sport often has the added bonus of being able to mix action with beautiful rural settings.

Having covered canoeing events as far afield as Nepal, Jerry Young had a good idea of the main problems he was likely to face at the World Slalom and Wild Water Canoeing Championships in Bala, Wales. The chief difficulties with this sport are finding a viewpoint which offers a good angle for photographing the fast moving subjects and reacting to the action quickly so that the images are sharp and correctly exposed.

Jerry spent the whole of practice day walking along each side of the course exploring all likely spots for providing

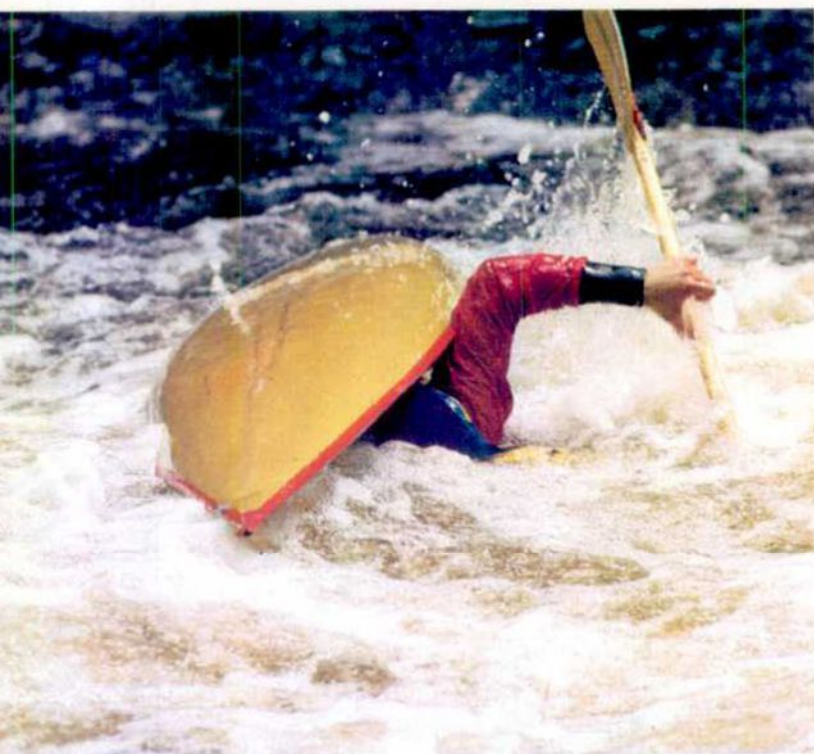
a good view of the canoes coming down the river. Areas where the water was particularly rough were inspected thoroughly since they offer the possibility of really spectacular shots as the canoeists struggle to negotiate the rapids. On occasions, Jerry has even been known to equip himself with an underwater housing and a wetsuit so that he can stand in the water to get just the right view of his subject.

Getting canoeists sharply in focus means prefocusing in front of them and shooting at the movement they move into the frame. Motordrives help the photographer to work more quickly and to concentrate on composition. To freeze the movement of the water and the canoeists, Jerry used shutter speeds of 1/500 or 1/1000 second. This meant using wide apertures, but the resulting shallow depth of field had the pleasing effect of

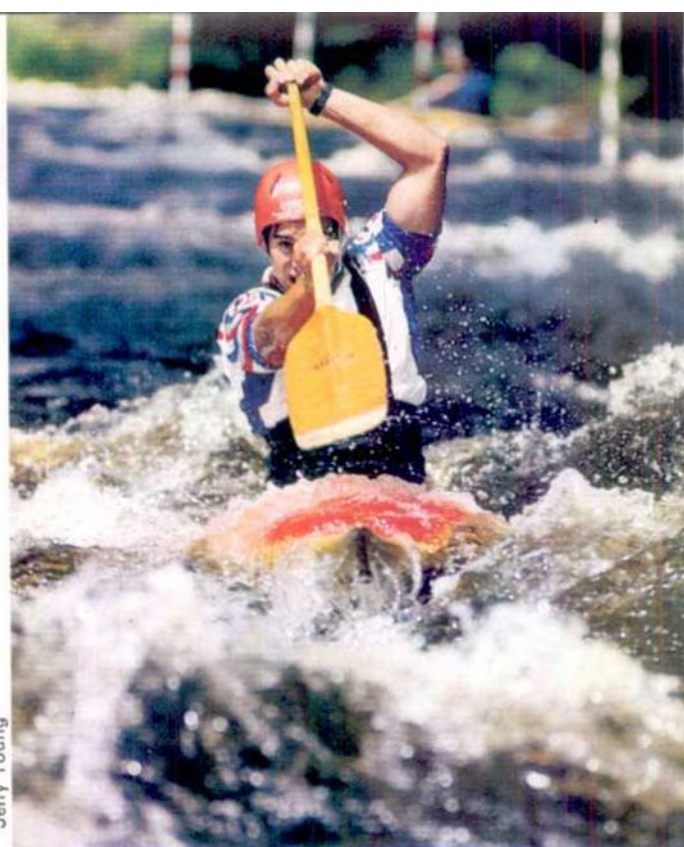


Jerry Young

White water The beautiful setting of waterfalls and trees add an extra dimension to the action. The bright colours of the canoes and the clothing also enhance the scene. **Over the waterfall** Jerry prefocused on the waterfall and waited for a canoeist



Jerry Young



Upside down Jerry was constantly on the alert for a moment of drama like this shot of an upturned canoe and a struggling canoeist. **Determination** A view straight from the front is particularly spectacular—this shot was timed so the power in the man's arms and the expression on his face create a sense of tension. **Walking back** Always looking for interesting details, Jerry found some of his subjects out of the water. **Action** A fast shutter speed is necessary to freeze the movement of water, as in this close-up view which really conveys the dynamic qualities of the sport. **Closer still** A lens as long as 300 mm is essential for detailed shots such as this dramatic view of a competitor ploughing through the water



defocusing the background, isolating the main subject.

Preferring the superior colour and sharpness of Kodachrome, Jerry used this film for all his shots—even though with a speed of 64 ASA, it is not ideal for action photography. Most of the shots shown here were taken with either a Nikkor 300 mm f/4.5 or a 180 mm f/2.8 fitted to one of his two Nikon F3 bodies. Jerry is wary of the automatic exposure setting which these cameras offer and nearly always uses the manual setting. Automatic cameras tend to be fooled by large areas of bright spray. So shots of canoeists would be overexposed.

Jerry always kept on the move during the event so that he had a range of shots taken from different angles, different viewpoints and different backgrounds. He also kept a sharp eye out for moments of drama—a canoeist capsizing in a rough section—or other moments of interest like the pair of canoeists shown carrying their craft back up to the starting position.



Creative approach

People at work

Taking pictures of people earning their living in everyday jobs is a neglected field of photography. With the right approach, people at work offer a surprising amount of interesting and unusual material



Work goes on all around us, and even if we are not doing it ourselves, it touches our lives at almost every point. From the early morning mail deliveries to the late night trains, people are earning their daily bread in a way that can be observed, photographed, and so finally shared. The fascination everybody has for the details of how others earn their livings, and for watching people engrossed in a productive task, means that a whole range of exciting subject matter is available to anyone.

There is more value in photographing people at work than the obvious photogenic aspects of the more spectacular occupations. Everyday jobs are often neglected as subjects for photography simply because they are around us all the time. But the pattern of work may be radically different in the future, and the photographs that you take of what may seem an ordinary way of life may be seen as a fascinating and unique record of work in the late 20th century.

There are several categories of subject that you can consider. First, there is your own work, and that of your colleagues at work. Second, there is the work of friends who do other jobs. You may also consider photographing the work of people whom you have never met, either those who have jobs which they carry out in public, such as railway staff or sales staff, or those whose work is not normally seen, from the staff of a tax office to the warehouse staff at a supermarket.

Your photography of people at work will depend on cooperation of both the individuals and their workmates, and the management of the organization they work for. Company attitudes towards photography will vary widely, but many will welcome it as a means of creating interest in the work being done, as long as there is no great disturbance of the work. A company or organization with whom you have no connections at all, however, will need to be satisfied about your motives, so it is best to start on home ground with your own or a friend's place of work so that you can build up a portfolio of your photographs to show others what you can do.

Having chosen your subject matter, you can now plan your approach. This is an important stage, since you must know what you will be faced with, as you

Clothes pegs Choose your viewpoint carefully to make the most of an attractive setting like this one



Girders Industrial photography can be difficult to arrange but the results can be quite spectacular

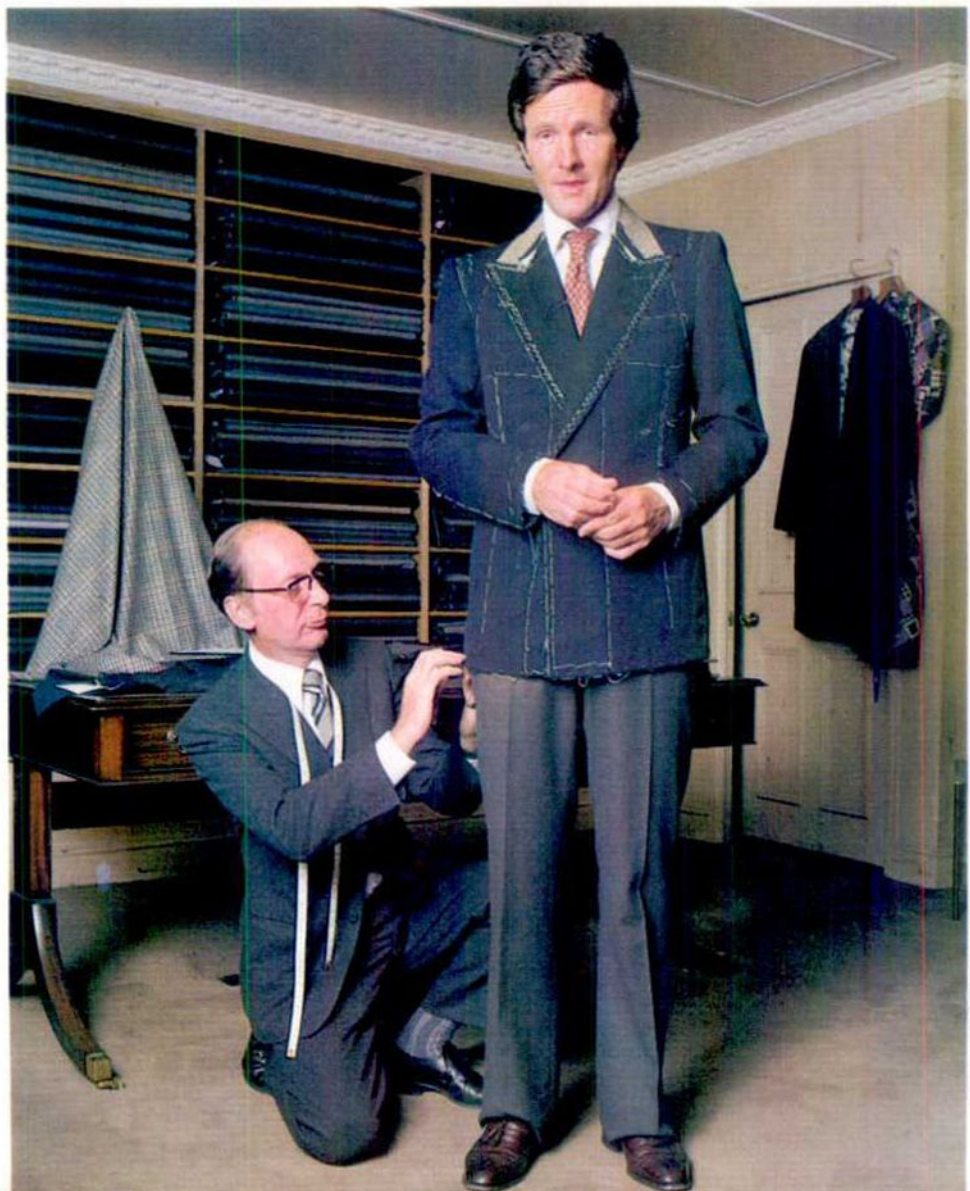
Tailor People who are proud of their work are usually happy to pose for a picture session

will not be able to rearrange things to suit yourself. Most work patterns do not vary much from day to day, however, so you may be able to plan individual shots after a preliminary visit.

To be certain of the best results, you should plan more than one visit to the workplace. This may not always be possible, from the point of view of either your own time or that of your subject's, but it is worth doing if you can. Suppose you have a friend whose workplace you are going to photograph. The first step is to accompany them to work without the intention of taking pictures. Simply use your eyes to look for opportunities for good photographs, and to assess the lighting and other technical details.

At this stage you can also get to know the people you will be photographing, and let them know when you will be returning in earnest. People have an understandable reluctance to being caught off guard by an outsider, and you will not be welcomed if you are seen as trying to take 'sneak' photography.

Take this opportunity to ask permission for your photography from the person who is in charge, stressing that you will in no way interfere with their actual daily work. Then, providing that everyone is happy, stay for a while and observe the pattern of the day's work.



The first visit is particularly important because, besides looking around for yourself, you will also be under observation. The way that you respond to people you meet for the first time, and the tact, interest and concern you show for the work they do, will greatly influence the photographic session you are now setting up for a future time. Of course, each job carries its own problems when you come to shoot the pictures. In a hospital, for example, you will probably be seeking the cooperation of both staff and patients, while in a factory you will need the foreman or manager's permission, and the workers' agreement. Only if your friend is self-employed, a builder or craftsman, for instance, will you be dealing only with a single subject.

Generally, most people are less self-conscious about their work than about their private lives. They often feel that work is a fit and proper subject for photographing. If you are photographing someone who is involved with their work, they will usually expect you to be focusing your attention on the job, rather than themselves, and as a result

Robin Laurance



John Walsley

they will be far less embarrassed than they might be on a straightforward portrait session. And your subject is in his or her natural surroundings, and at least partly absorbed in normal activities. In these conditions you have a much better chance of an interesting and relaxed photograph.

People working offer good subjects for photography, partly because their attention is directed towards the job in hand, and not towards you, and partly because you can make the setting and activity a central and absorbing part of the photograph. Most people take a pride in their work, and none more so than those who are self-employed or self-made, or those who use skills that they can show off. A good deal of the

The yawn Desk work provides few points of visual interest—so make the most of the human element

satisfaction that such people gain from their job is in other people's appreciation of what they do, and in these cases your photography will clearly be welcomed. If you ask a shopkeeper to pose in front of his shop, for instance, you will probably get very good cooperation and a successful result.

However, if you want to be more ambitious, you could see what opportunities there are for showing your subjects in relation to their work. This might mean depicting the activity, such as a carpenter pausing for a moment to look up from his lathe, or the actual tools

of the trade, such as a fireman with the engine, hoses, and other apparatus. Alternatively, show the person with the product itself, even if they are only involved with the manufacture of a part of it. Where there is no product involved, try to think of a suitable end result, even if it is whimsical: a traffic warden in a street empty of cars, for example.

You might consider doing a series of work portraits in a particular style, covering widely different jobs, but with a single treatment. Because such photographs are portraits, rather than studies of a particular method of working, it is possible to impose a consistent style on them. One method, frequently favoured by magazines and newspapers, makes use of a wide angle lens to show the individual, usually full-length, in front of the workplace, with the product in the foreground. The advantage of this technique is that you can give as much information as possible about the work in your photograph.

Another idea would be to concentrate on working clothes and uniforms, perhaps allowing just the dress and the tools of the trade to show the activity. On the other hand, there are many jobs—mostly crafts—which are fascinating because of the skills and techniques involved. If you choose a subject that you are particularly interested in, you may even learn something in the process. Perhaps you want to find out exactly how glass is blown, or how an expert fishmonger fillets a fish, or how police dogs are trained.

Showing the development of a particular job needs a different approach. In most cases you will not be able to show everything in one shot, and so you will have to work out a sequence. Planning the steps needs a certain amount of organization and for each

Fisherman Using a wide angle lens enables you to include as much of an interesting, if cluttered, place of work as you can. Ask your subject to help you rearrange things to make a pleasant composition

Casino Attractive or glamorous settings do not guarantee good shots. Further, if the lighting is dim the use of flash may cause problems, especially if discretion is needed to avoid disturbing your subjects

Robin Laurance



photograph you will need to find a viewpoint and scale that gives the clearest idea of what is going on. In addition, you should also try to create some visual contrast between the photographs, particularly if you intend to display them together. You could vary your pictures, for instance, between an overall view that establishes the activity in the context of its surroundings—perhaps using a wide angle lens—mid shots that might show a head-and-shoulders view of someone working, and close-up shots of a pair of hands in a detailed stage of the process.

In circumstances where the work is taking place in a fairly public place, you may decide that you want to take candid photographs of people at work. The difficulty with most candid photographs is that people are likely to notice you,

but if they are working the chances are that they may be preoccupied with what they are doing, and so will be much less aware of you waiting with your camera. Using a telephoto lens, you stand less chance of being seen by, say, workers on a construction site, than by people who are just sitting in a park for their lunch break. Furthermore, someone working is less likely to be bothered by you, even if you have been noticed. Road workers, construction workers, builders, railway employees, market traders, house painters, or dock workers are all generally accessible subjects. In fact, it may be better to keep off the actual work site to avoid danger to yourself, and to avoid the need for personal accident insurance which a construction company may insist upon if you ask permission to enter the site.

People with jobs that are in some way sensitive, such as the police in certain situations, are probably best avoided.

Whatever profession or job you choose to concentrate on, and whatever type of approach, remember that it is the details of that particular work which make it worth photographing. If you decide to photograph an artisan, for example, you can concentrate on those very things which give the work its individuality. These include the tools and raw materials that are used, the objects that are fashioned through various stages of production, the hands that control and direct each delicate operation, and the expression on a face which may pass through intense concentration, to irritation, pleasure, or even pain if a hand slips! Be aware of all these details which are going on, and try to capture some of them in your photographs, which will be much more interesting as a result.

Occupations which do not have a clearly defined product or nature present particular problems. These include many white collar jobs, such as accountancy or clerical work. In such a case, you must try to include visual clues to the person's specialization. An accountant may prefer to be seen at an empty, tidy desk, but some hint of his job would be gained from a background of filing boxes bearing the names of different accounts. There is also the possibility of a photo-montage or superimposition to reveal pages of figures, or ledger details.

However, once you begin to think in creative ways, even the most boring looking work can be transformed into a successful photograph.

Peacocks If the work is particularly unusual, make sure your picture shows clearly how it is being done



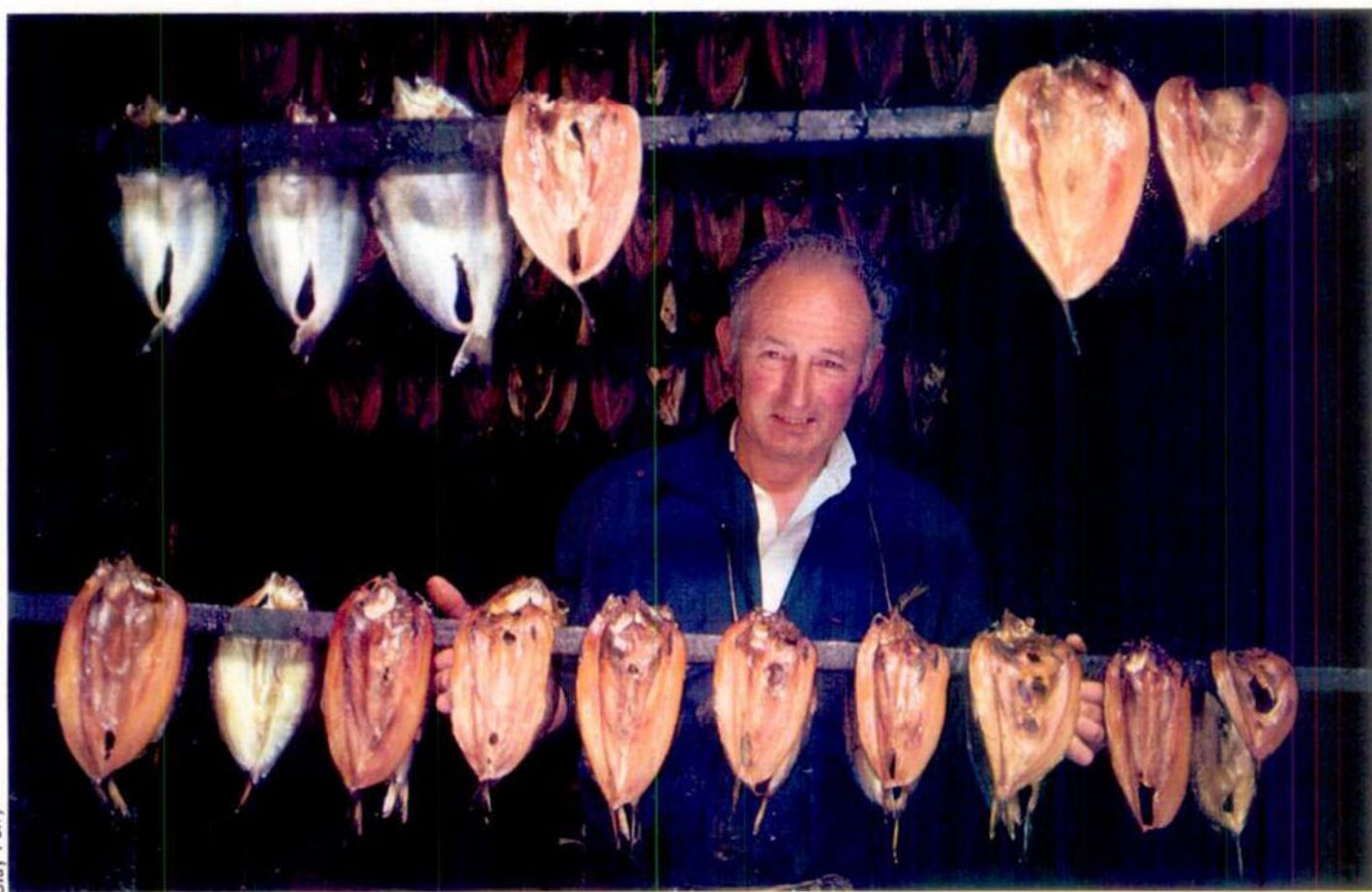
Gerard de Vecchio/fotogram

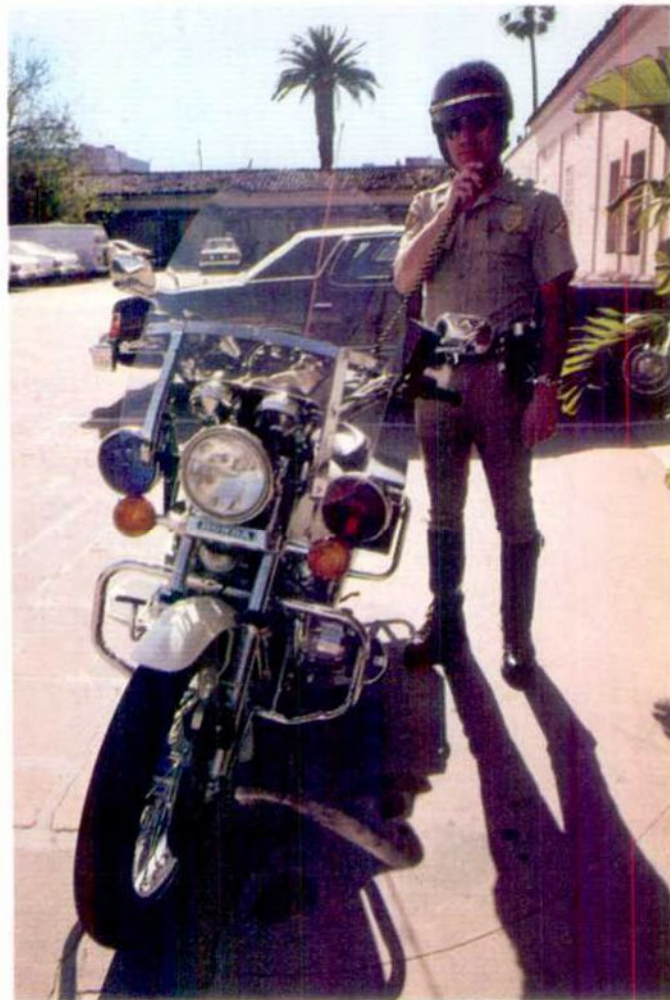
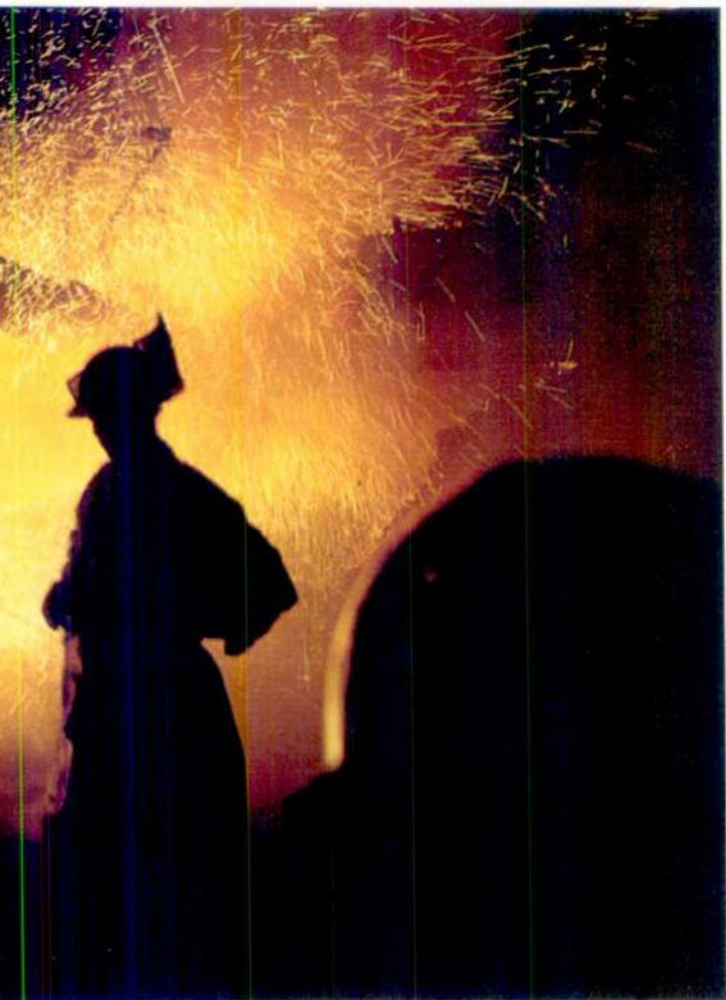


P. Weisbecker/Explorer



Clay Perry





Richard & Sally Greenhill



Herbie Knott

Hyperfocal distance

Depth of field is an important feature of image formation. One aspect in particular, known as the hyperfocal distance, can be extremely useful in controlling the overall sharpness of a picture

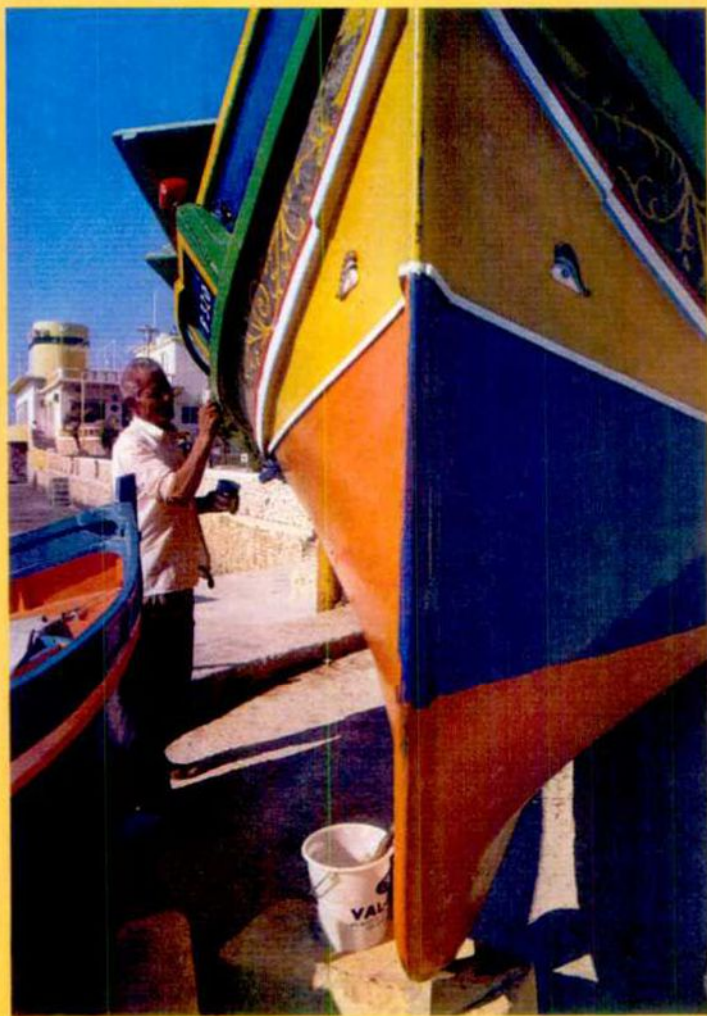
Of all the technical qualities of a photograph, one of the most prized is sharpness. In a good photograph, the parts of the picture that the photographer wants to be in focus are perfectly sharp; the rest are blurred. Yet there is only one means of controlling what can be made sharp and what can not and this is by exploiting the camera's depth of field. Consequently, depth of field calculations have an important part to play in photography.

When focusing on your subject, you normally focus on one point only, yet because the lens has depth of field, points both nearer and further away from the camera than the focusing point are sharp. When photographing landscapes or other distant subjects photographers often choose infinity as their focus point, believing that this will ensure everything is in focus. Yet, if the lens is focused on infinity, a good deal of potential depth of field is wasted, because it extends beyond infinity.

Maximum depth of field is achieved by focusing on the *hyperfocal distance*—a point nearer to the camera than infinity—so that the depth of field extends just to infinity but includes points much nearer to the camera than if the camera were focused at the infinity setting.

The hyperfocal point is, in fact, located at the nearest point that is in focus with the camera focused on infinity. The distance from this point to the camera lens is known as the hyperfocal distance.

When the lens is focused on the hyperfocal point, the depth of field is extended so that every part of the subject from half the hyperfocal distance to infinity is rendered



Maximum depth Sharp focus extends from near objects to infinity with the lens focused on the hyperfocal distance

acceptably sharp in the image.

With a wide angle lens, which has a large depth of field anyway, setting the lens in this way can avoid the need to focus for snapshot pictures. The lenses of simple cameras, both stills and movie, are often fixed to focus on the hyperfocal distance. But this distance partly depends on the aperture in use—as the aperture in use changes, so does the hyperfocal distance. Some movie cameras shift

the point of focus automatically to allow for this.

However, the distance depends, not only on the aperture, but also on the focal length of the lens, and on what is defined as being 'acceptably sharp'.

Standards of sharpness

When discussing the image formed by a lens, it is usual to have a point as the subject. The image of this point is actually a very small disc of

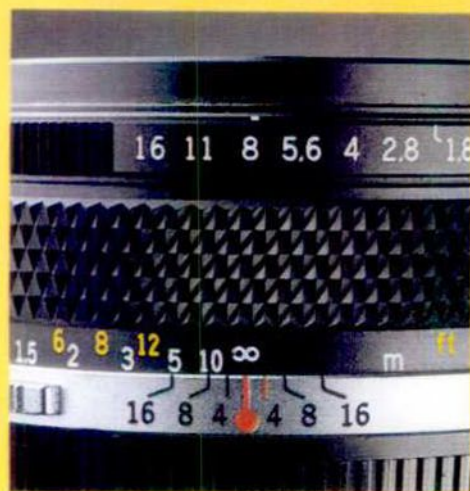
light. In theory, this disc is infinitely small and is a true point. But this can never be achieved in practice.

These discs, known as *circles of confusion* (see page 30), are smallest at the point of focus. So if the focus point for a particular object does not coincide with the film plane (the object is out of focus), but falls in front or behind it, the image disc recorded by the film will be larger. An overall image made up of large discs of light looks unsharp, and the larger the discs, the more unsharp the image looks.

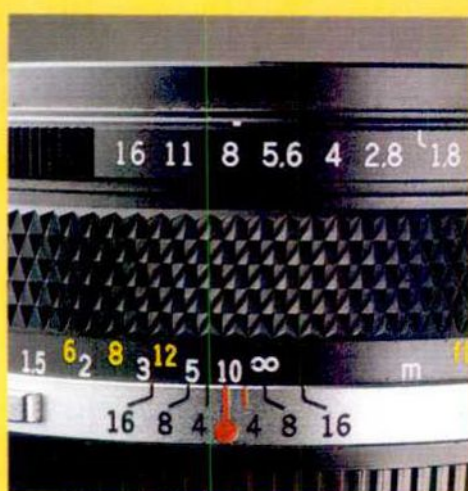
If the discs are below a certain diameter, however, the image will look perfectly sharp to the unaided eyes, even if the focusing is not absolutely precise. This is because the eyes are not able to resolve details below this size. Looking at the image with a magnifier reveals its lack of critical sharpness. It is generally accepted that circles of confusion up to 0.25 mm in diameter are indistinguishable from true points, even with good eyesight. This is regarded as a reasonable standard of sharpness in images that will be viewed without magnification.

In simple terms, the disc of light at the point of focus can be seen as the pinnacle of a cone of light. The base of the cone is the aperture. If the size of the aperture is reduced (stopped down) the cone becomes narrower. A cross section of the cone, at any point along its length, represents a circle of confusion. But at one particular point is the circle or disc which has the maximum permissible diameter for sharpness. If the cone becomes narrower, this point effectively moves farther towards the

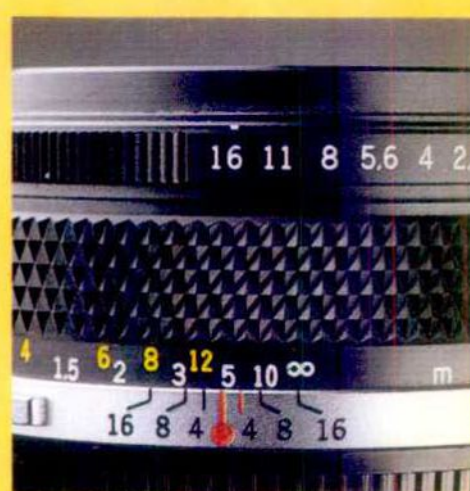
Robin Bath



Lens at infinity With the aperture set at $f/8$, the depth of field index mark for this value indicates the hyperfocal distance—in this case, 10 m



Lens at hyperfocal distance Still at $f/8$, the infinity mark is moved to the index for this stop, so giving maximum depth of field for this aperture



Stopped down Changes in aperture alter the hyperfocal distance, which, at the smallest stop, gives the maximum possible depth of field for the lens

lens. In this way, the depth of focus is increased, and this corresponds to an increase in depth of field.

It should be noted that most negatives are printed by enlargement, and most transparencies are projected or reproduced larger than the original. The standard of sharpness must therefore be great enough to permit the required degree of enlargement without the final image looking unsharp.

For 35 mm pictures, a maximum diameter for the circle of confusion is taken to be $1/30$ mm. A 35 mm negative or transparency reaching this standard can be enlarged $7\frac{1}{2}$ times without loss of sharpness. Bigger enlargements are generally looked at from proportionately greater distances, and so a lower standard of sharpness is acceptable.

Calculating the distance

Hyperfocal distance forms the basis for depth of field calculations. But the distance can itself be worked out using a standard formula. This involves values for the focal length of the lens, the selected aperture, and the size of the maximum permissible circle of confusion.

For a 50 mm lens at $f/2$, the hyperfocal distance works out to be 37.5 metres. If the f -number is doubled to $f/4$, the hyperfocal distance is halved to 18.75 m. At $f/8$, the distance is halved again to 9.375 m, and so on. At $f/11$, the hyperfocal distance is around 6.8 m. If the lens is focused at this distance, the depth of field extends from

3.4 m to infinity, sufficient for most distant and some semi-distant scenes.

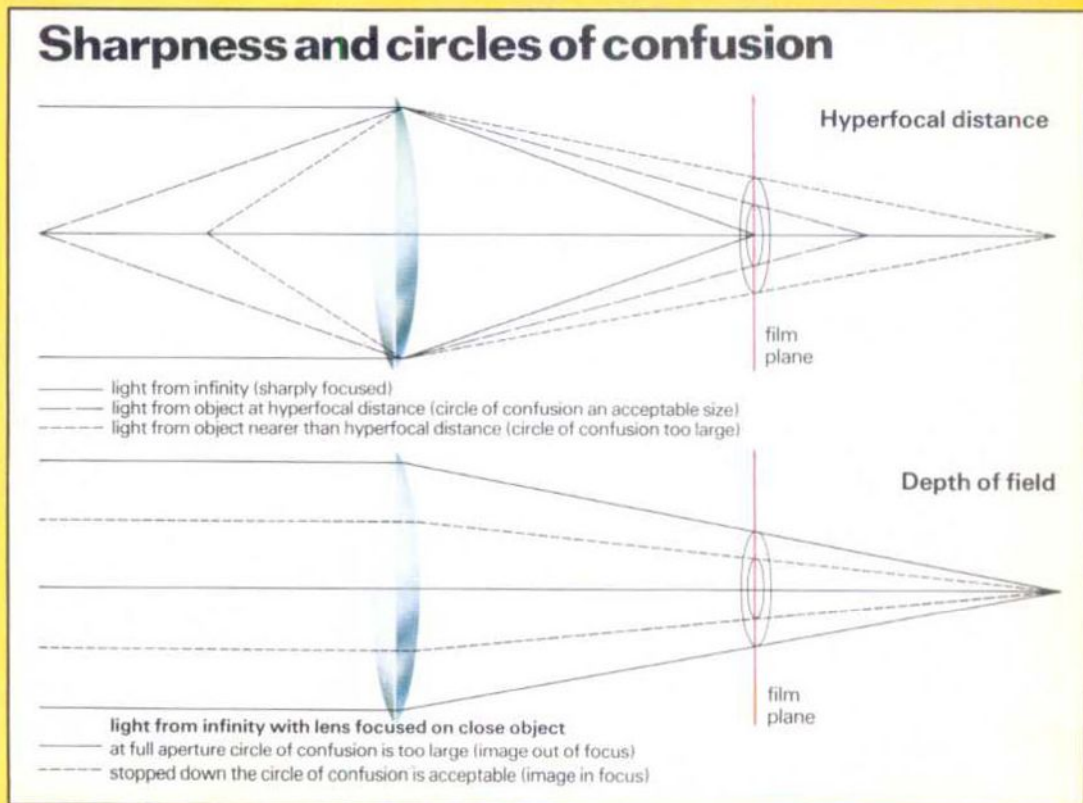
Fortunately it is not usually necessary to calculate the hyperfocal distance or depth of field. Most lenses are sold with printed tables which show the depth of field for each aperture, for a range of focused distances. So, these tables can be used to accurately set the lens for the maximum sharpness range.

Separate tables, published in books and guides, can be used for lenses which do not

have tables provided. But some of these tables are misleading. Many were compiled when lenses of particular focal lengths were meant for particular film formats. The maximum circle of confusion, upon which the tables are based, is calculated according to this format. But now there is no strict relationship between focal length and format. A range of tables may be needed for a single focal length, calculated according to the different formats for which it can be used.

A less accurate way of judging depth of field, and so hyperfocal distance, is by using the scale printed on the barrels of most lenses. With the lens focused at infinity, and the aperture set at, say, $f/8$, the index mark for this aperture gives the hyperfocal distance. Alternatively, with the infinity mark set at the $f/8$ index, the focusing mark shows the hyperfocal distance. This is how the lens is set for maximum depth of field to allow snapshot photography without focusing.

Criteria for sharpness The image of a point appears to be sharp if the circle of confusion it forms is below a certain size. In the lower diagram the lens is focused closer than infinity. But a point at infinity is sharp when the lens is stopped down





World of photography

Marc Riboud

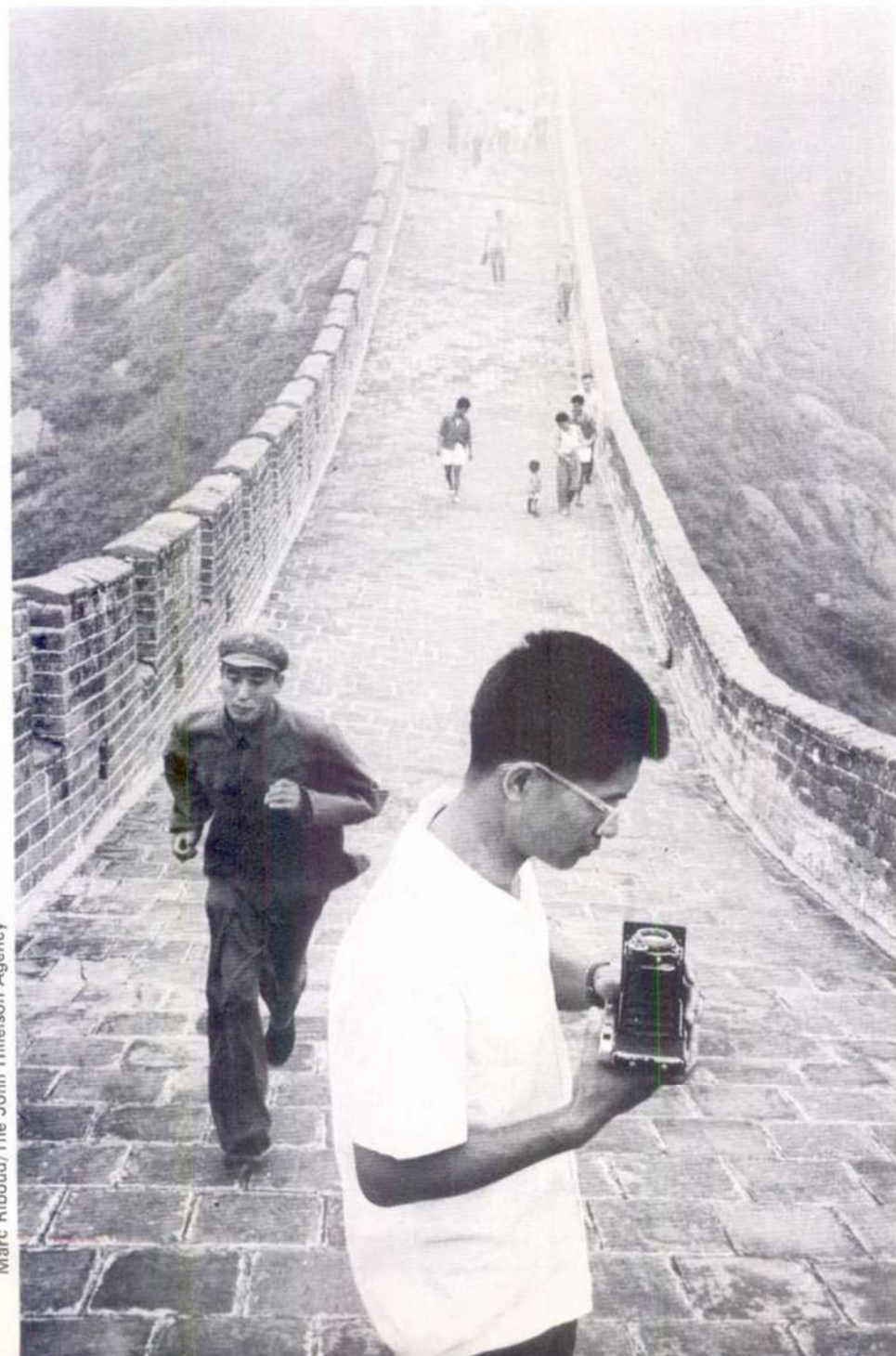
In a career spanning over 30 years, Marc Riboud has established himself as one of the world's most highly respected and influential photojournalists

One of the most important pieces of equipment for a photographer is a good pair of shoes, according to Marc Riboud, and for a photographer who spends much of his life on the move, this seems an eminently realistic attitude. Though he covers the world on assignment for such major publications as *GEO*, *Stern*, and the London *Sunday Times*, his whole attitude to work follows this down to earth and simple approach.

Travelling to exotic and faraway places with a camera—and actually

being paid to do it—seems to be an idyllic way of life. Yet though Riboud loves the constant globetrotting that goes with his brand of photojournalism, it is always photography that is uppermost in his mind. He is a photographer first and traveller second.

It comes as a surprise, then, to learn that Riboud did not become a photographer until he was 30. 'Today at 30', he says, smiling, 'photographers are already too old.' His first profession was engineering, but he found himself be-



Marc Riboud/The John Hillelson Agency



Peking, 1965 *The distinctive doors and windows of the Liulichang, or antique dealer's street, have been used to frame this charming street scene*

Ferryboat, Vietnam, 1975 (right) *Taken to show the clear physical differences between the people of the north—the soldier—and the south—the girl*

The Great Wall of China, 1971 *During his frequent visits, Riboud noticed a growing enthusiasm for photography among the Chinese tourists he met*

coming increasingly interested in photography. Then, one day, he decided to take a week-long holiday to photograph a festival and simply never returned. 'They are still waiting for me!' he says.

Now Riboud is in his 50s. Looking back on half a lifetime, he sees that it was inevitable that he should become a photographer. He remembers being visually oriented, even as a child. This meant that at the age of 16 he, out of a family of seven children, was the one to inherit his father's Leica.

Riboud had no formal training in photography. The photographers he met when starting out shared the view that to know how to travel, to know the world, and to know how to observe, were more important than any discussions about photographic technique. Riboud still thinks this is true. 'All this is much more important and much more difficult and takes much longer to learn than to know how to use a camera.' He feels that a person can learn how to operate a camera in two weeks. He learned other



things, such as composition and use of light, simply by taking pictures and by listening to the criticisms of other photographers—particularly those in Magnum, the photographic agency.

When Riboud began his career as a photographer, he did not sell his pictures right away, nor did he seek commissions. Even now, it is travelling to the places that he wants to photograph that determines the stories that he does.

'If I am obsessed about going somewhere, I end up by going there. And either I sell the pictures when I come back—I try to sell them—or I get a guarantee of publication before I go. But I think that the most appealing aspect is to have an interest in the subject.'

A feature on Naples that he did for *GEO* was a commission, but one he organized himself. The editors of the magazine were considering several cities on which they wanted to do stories. Knowing this, Riboud approached them with his desire to do Naples, simply because of a personal wish to go there. They agreed, discussed the feature, and then left him to develop the story as he saw fit. Riboud travelled to Naples three times. His brief was simply 'a question of discovering Naples, and not just from the tourist's point of view.'

If Riboud is not stimulated by the subject, he sometimes feels that he has to

Marc Riboud/The John Hilleison Agency



Naples, 1979 From a photoessay on the city taken for the magazine *GEO*. Demonstrations such as this one are a recurring feature of city life

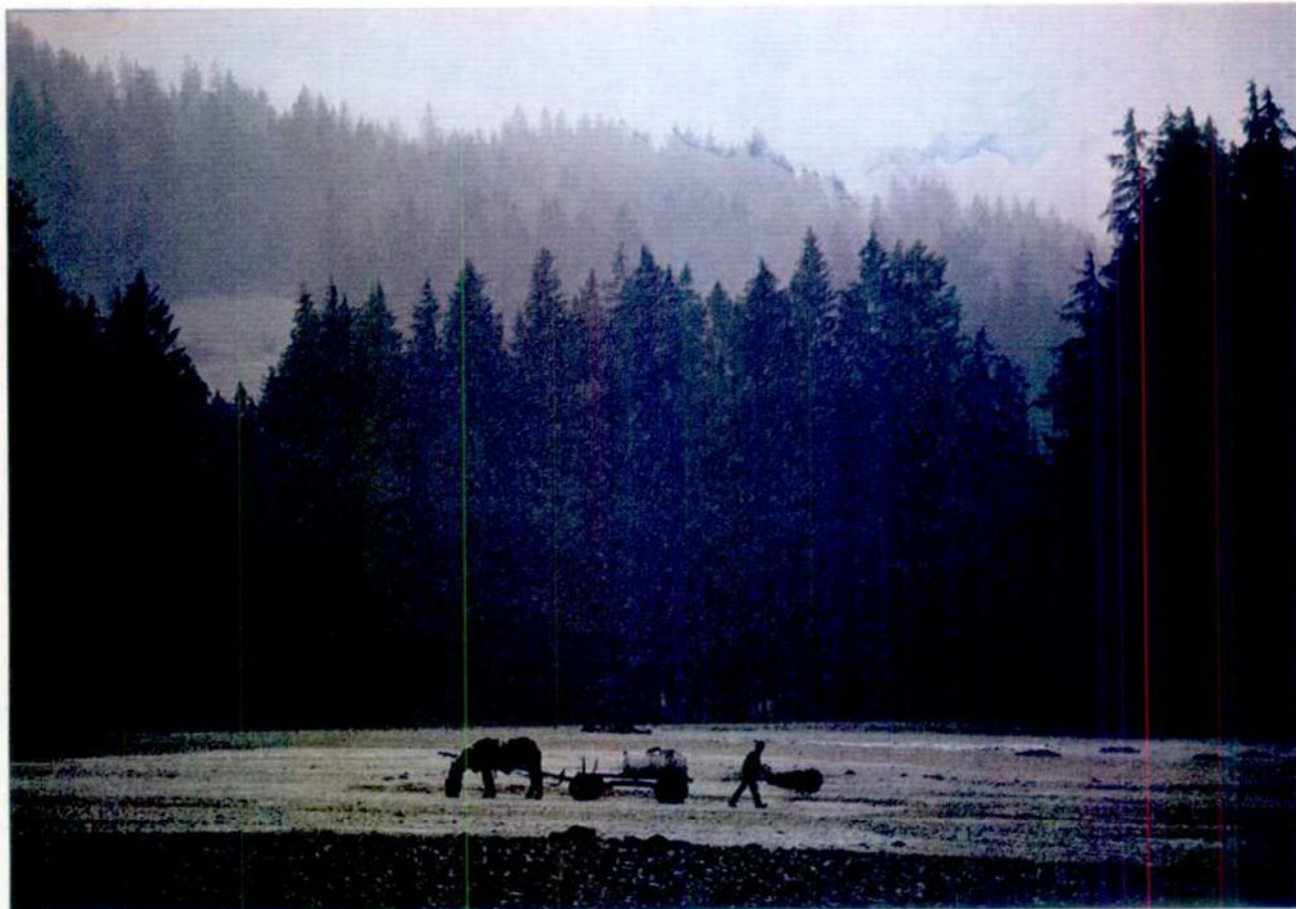


Dubai, 1974 VIPs being greeted at the airport, taken for the *London Sunday Times* for a story on the oil rich states of the Arabian Gulf





Marc Riboud/The John Hillelson Agency



After the death of Ho Chi Minh, 1969 Women listen to speeches given at a meeting in Phat Diem in memory of the revered Vietnamese leader

Rural Poland, 1980 This picture of peasants working in a winter landscape was taken during Riboud's month-long tour of the countryside

decline the commission, as he did when he was asked to photograph the Hall of Mirrors in the Palace of Versailles. 'I said, "No, it's not my cup of tea. I wouldn't like to do it and I wouldn't know how to do it."'

Not all of the assignments Riboud takes or gives himself are pleasant. On several occasions he went to both North and South Vietnam, staying several months at a time. The most dangerous situation he experienced during the Vietnam War was when he found himself in the midst of a bombing by the US Air Force. 'We had to go into these little foxholes which were full of water from the monsoons and crowded with men and there was bombing all around. The noise was tremendous.'

The unpredictable aspects of photojournalism are what interest Riboud particularly. He describes the moment of taking pictures as one that actually gives him physical pleasure. 'You suddenly realize that luck is on your side, when all those elements that are necessary to make a good picture happen to combine. It's like a lot of lines. You have the light, the composition, the subject matter, the background, the landscape, the people. For example, if there is a window in the scene, you hope and pray that someone will suddenly appear at that window and that the light stays good. Sometimes in life, all those lines converge at the same point at the same time and maybe with luck an unexpected element may even occur, almost miraculously. Being there in that place and at that time, gives you a feeling of great satisfaction.' It isn't carrying the camera bags that is tiring, he says, but more the tension of looking and hoping for that one moment to happen when some of the elements come together.

Nevertheless, Riboud likes his equipment to be light, reliable, simple and limited. One of the reasons for this is that he has found that the more technically complicated the equipment is, the more things there are that can go wrong. 'And', he says, 'it always happens that it is during the greatest intensity of a situation that you have technical problems.' One of the worst experiences he had was when one of his two cameras jammed just as France's newly elected President Mitterand appeared during the inaugural parade, with crowds of spectators and photographers pushing for a view—after Riboud had spent three hours waiting for that moment to happen.

Riboud uses Olympus cameras for his colour work, but prefers to use Leicas when shooting black and white. On a trip that will last three or four months, he takes four camera bodies and will only work with two during a day's shooting, but likes to have two spare bodies. For lenses, he uses the 35, the 50, and the 105 mm or a zoom.

Riboud shoots in both black and white and colour, carrying one camera loaded with each type of film while he is working. He favours black and white. When taking or even looking at colour images, he

prefers those where there is very little colour. 'I can understand the taste for violent, electric colour, but it is not my taste', he explains, adding thoughtfully, 'Grey is a very beautiful colour.' In his book *Visions of China* he even converted some pictures taken with colour film to black and white.

For his black and white work, Riboud uses Tri-X primarily and sometimes uses Ilford films. For colour he uses Kodachrome 64 and Ektachrome. On a trip he might take a maximum of 140 rolls of film.

His most celebrated trips are those that he made to China during 1957 and 1980, going first at a time when very few foreigners were allowed into the country. He explains his initial reason for going in the form of an analogy: 'I was drawn to China just like a person attracted by curiosity moves towards a noise or commotion in the street.'

Two of Riboud's books are on China, one titled *Three Banners of China*. His most recent, called *Visions of China*, is a selection of photographs taken during the 23 years he spent covering the country. His other book is called *The Face of North Vietnam* and for this book he was given the Overseas Press Club Award in 1970. His favourite book, though, is always his most recent. 'My

Carnival, 1979 Rooted in ancient pagan festivals, celebrations such as this one in a small village south of Naples are held throughout Italy

Painting the Eiffel Tower The first of Riboud's pictures to be published, this image appeared in the early 1950s in the prestigious American magazine *Life*

most recent book is the one which is living with me—I feel that I have just given birth because I spend a lot of time on a book—there is a physical reaction.'

There is no doubt about Riboud's intense involvement with his work, and this means that he must be in the right frame of mind to take good pictures. 'If you are worrying about a personal problem, then you are not ready to see and be attentive.' Photography, he feels, is essentially a question of being alert and observant to what is going on, whether one is in an exotic faraway place like China or even just walking down one's own street. 'Photography is to be quick, to see visual relationships and to be able to take the picture on impulse, not be analyzing the elements. I think the most important thing in photography is to be ready for the surprise and not to have set ideas.'

Marc Riboud/The John Hillelson Agency





Fast lenses

Fast lenses made today boast maximum apertures which would have been unthinkable a few years ago. However, you must decide whether they are worth the cost in terms of bulk and weight, as well as expense

When the light is low or when you have a fast film in the camera, you may find to your annoyance that you just cannot open the lens far enough to give correct exposure. With a long lens, when you may want a fast shutter speed to capture movement or reduce the effects of camera shake, this can happen even in fairly good light. The solution to this problem may be to buy a lens with a large maximum aperture.

It used to be difficult to combine a large maximum aperture with reasonable lens performance, but recent advances in lens production, such as computerized design, better optical glass and multi-coatings, have meant that even fast lenses—those with large maximum apertures—can give good quality at full aperture. Modern fast lenses range from lenses of normal design that give perhaps only a fraction of a stop extra to special aspheric lenses that can give up to two full stops.

The main obstacle to producing fast lenses is that as the aperture is opened further and further, many types of aberration become increasingly severe. The result is that image quality suffers—highlights in particular tend to flare. This sort of problem is normally overcome by stopping down. To give good results at wide apertures, fast lenses must include special correction elements.

Inevitably, the fast lenses are expensive and, in some cases, may cost ten times as much as their slow equivalent. The less expensive fast lenses, particularly telephotos, often achieve the necessary wide aperture correction by including more and larger elements, and for really large apertures must be very big and bulky indeed—the Canon FD 400 mm lens which has a maximum aperture of $f/2.8$, for instance, weighs 4500 grams and is 166 mm in diameter: the Canon is by no means unusual. Such lenses are difficult to use without a tripod and are very awkward to carry around. Smaller, lighter—though still large—fast lenses, on the other hand, achieve their speed by using specially shaped elements or special materials in the glass. This type of lens is the most expensive.

Genuinely fast lenses, therefore, tend to be specialist items and there is little point in paying out a great deal of extra money unless you are sure that you can use the low light facility. Similarly, you hardly need an expensive fast telephoto if you never take it out because it is so heavy. Neither is there much point in buying a superfast lens if you only use the maximum aperture once every few

months—for those rare shots where the low light facility is essential, you could hire the lens.

Nevertheless, there are some semi-fast lenses that cost only a little more than their slower equivalents and these might provide a more practical alternative if you use the extra speed rarely. However, it is not worth paying much more for the difference between $f/2.5$ and $f/2.8$ —such a small advantage is of little value.

Fast versions are available for lenses of most focal lengths, though there is no doubt that it is for telephotos that they have their main use.

Fast standard

A typical fast standard lens is the 50 mm $f/1.4$ lens which is available for most 35 mm cameras as an alternative to the traditional $f/2$ lens. The $f/1.4$ lens gives an additional stop, though the weight, cost and bulk are significantly greater too. As a compromise, and because lens speed is a selling point, many manu-

facturers offer standard lenses with maximum apertures of $f/1.9$, $f/1.8$, $f/1.7$, and even $f/1.6$. But beyond $f/2$, every small gain in speed is at some expense—the diameters of the lens elements must be increased and the performance at small apertures deteriorates, giving a usable limit of $f/16$. A full extra element is needed to reach $f/1.4$.

Increasing the aperture beyond $f/1.4$ without severe loss of quality is very difficult and there are less than a dozen standard lenses available with apertures of $f/1.2$, which is only half a stop faster than $f/1.4$. At present, the fastest standard lens available is the 50 mm $f/1$ Noctilux-M, for the Leica M camera. Perhaps the fastest standard lens ever to have been on sale for general photography was a 50 mm $f/0.95$ Canon, designed for a rangefinder camera, but this has been discontinued. Lenses of this speed are used in closed circuit TV cameras, but are not adaptable to still cameras.

Nevertheless, a fast standard lens





remains something of a gimmick, since for most purposes an aperture of $f/2$ is quite large enough, and many professionals find that the sacrifice in quality necessary to achieve a wider aperture is too great. Surprisingly, however, fast lenses are valuable at short focal lengths.

Wide angles

Camera shake is not so severe a problem with wide angle lenses and it is not so important to have a wide maximum aperture to allow the use of fast shutter speeds. But lens corrections become more difficult as the angle of view increases and with lenses shorter than 28 mm a maximum aperture of $f/2$ is difficult to achieve without using large numbers of elements, making the lens bulky.

Nevertheless, considerable research and development has gone into producing lightweight fast wide angle lenses using special lens elements. It is in this range in particular that aspheric and floating elements are incorporated into the design.

An aspheric lens element has a surface which, while costly to produce, does not give many types of aberration associated with spherical elements, and so reduces the number of elements needed in the lens. This allows quality to be maintained even at wide apertures. Aspheric elements are sometimes used in standard lenses as well. But they can increase the cost of a lens by a factor of five to ten.

Ballet stage A typical example of a situation in which a fast lens is a great asset. As flash photography is often forbidden in theatres, a fast lens is one solution to the problem

Standard lenses

There is a great difference in size between the front elements of fast lenses and their slower counterparts. The larger lens has an aperture of $f/1.2$; the other, $f/1.8$

Fast lenses (left)

You can buy fast lenses in many focal lengths. These range from 35 to 180 mm, and from $f/1.2$ to $f/2.8$. Not many photographers, however, could afford such a selection



Dave King/Equipment Courtesy of Nikon



Fast telephoto The faster the lens, the bulkier and heavier it becomes for a given focal length. This 180 mm $f/2.8$ lens weighs nearly one kilogram

Fast telephotos

For telephoto lenses, a wide maximum aperture is particularly useful. Because of the method of construction, telephotos cannot have very wide maximum apertures—a 300 mm lens with a maximum aperture of $f/2.8$ is very fast. This means that even in fairly good light, you may not be able to give sufficient exposure for a slow film. An extra stop therefore considerably increases the versatility of the lens.

Fast lenses are also valuable in the telephoto range because they allow the use of higher shutter speeds to avoid the effects of camera shake. This means they can be used hand-held or for fast moving subjects in conditions where a slower lens could not. This again increases the versatility of that focal length.

Large aperture telephotos are particularly useful when a teleconverter is fitted. For example, when a $\times 2$ teleconverter is used the focal length is doubled but the aperture is reduced by two stops. With a fast lens, the viewfinder image is still reasonably bright, and you can achieve correct exposure even in fairly low light.

Many long focus lenses, in the 85 to 200 mm range, have maximum apertures of $f/2$ or better. Typical examples are those from the Nikon range, such as the 85 mm $f/1.4$, and 105, 135 and 200 mm lenses all with maximum apertures of $f/2$. Other manufacturers such as Canon, Pentax and Leitz have comparable items. A few also produce 300 mm $f/2.8$ lenses, and Canon offer a 400 mm $f/2.8$ model.

For such lenses, the limits to large aperture performance are not set by spherical aberration, but rather by transverse chromatic—or lateral colour

—aberration (see page 907). This aberration gives colour fringes to image detail, and gets worse with increases in focal length. Unlike spherical aberrations, no improvement is possible by stopping the lens down. But in the case of lenses designed to be used in low light, this would hardly be a convenient solution.

One cure is to use expensive and fragile calcium fluoride (fluorite) lenses in place of the usual glass elements. Many lenses still use this method. But now special ED (extra-low dispersion) or UD (ultra-low dispersion) glass is available. Light refracted through this type of glass is not spread (dispersed) as much as it is through normal optical glass and this reduces chromatic aberrations.

All fast, long focus lenses are large, heavy and expensive. They require very precise focusing as the depth of field, which reduces as focal length increases, is very small at full aperture. Reflex focusing is essential, and, in fact, can be more positive with these lenses. This is due to the brighter image, and because the reduced depth of field makes the point of focus more obvious.

However, with fast long focus lenses, the shallow depth of field can sometimes be a problem. There is little point in using a fast lens for low light exposures, if you then have to stop down to get the depth you want.

Very long focus lenses, in the 500 to 1000 mm focal length range, were once limited to very small maximum apertures. This was due not only to lateral colour, but also to the cost of large glass elements and the final size of the lens and focusing mount. Mirror lenses give compact alternatives in this class, though with the disadvantage of fixed apertures.

Now, however, ED glass is used in conventional designs to give apertures of $f/4.5$ for 500 mm lenses and $f/5.6$ for 800 mm models.

The IF-ED type of lens is also very useful. This has *internal focusing*, which means that a group of elements moves axially inside the lens barrel to focus the image so that as you focus, the lens stays a constant length rather than being racked in and out. Focusing is very light and swift, ideal for sports and wildlife photography. This type of design compensates, to some extent, for the bulkiness caused by large aperture designs.

Fast or slow?

Choosing between a fast lens and the corresponding normal speed one is largely a matter of balancing the undoubted advantages against the bulk and cost. Remember, though, that a fast lens is not necessarily a better performer, aperture for aperture, than a slower one of the same focal length. Its maximum aperture performance may only be 'acceptable' and not even 'good' (spherical lenses are the exception here).

The average user may never need to use an aperture larger than $f/4$. Few amateurs would actually need fast lenses, unless specializing in low light

The floating element is coupled to the focusing control of the lens. It moves separately from the other elements to improve performance at closer distances. Like aspheric elements, the floating element allows wide apertures in wide angle lenses while avoiding undue deterioration in image quality.

Lenses of 35 mm focal length are available with apertures of $f/2$ and even $f/1.4$. Wider lenses, between 20 and 28 mm, can also have apertures of $f/2$, though such lenses are more difficult to make.

Fast wide angle lenses have particular advantages over normal speed lenses of similar focal lengths. The shallower depth of field possible with such lenses allows differential focusing techniques (see page 87). This is often not possible with slower wide angle lenses as their depth of field is so great, even at full aperture. This means that the fast lenses are more versatile even in normal light conditions. However, sometimes it may be necessary to use neutral density filters, which cut down the light travelling through the lens without affecting its colour, to allow correct exposure with a wide aperture.

However, it is in the telephoto range that fast lenses have the most practical value because camera shake is very much more likely. A fast lens helps you to avoid this by allowing faster shutter speeds to be used.



Fast lens plus teleconverter Medium speed lenses become very slow when used with a teleconverter, but fast lenses retain an acceptable maximum aperture

Concert audience Shooting a moving subject in low light presents special problems. Here, a fast lens allowed the photographer to freeze at least some of the movement by using a faster speed than a slow lens would have allowed

photography. Even professionals tend to hire fast long telephotos, though they often own a fast standard or wide angle lens. Large aperture lenses also have their own special problems. For example, the accuracy of focusing needed at maximum aperture means that the viewfinder must often be corrected for any deficiencies in the photographer's eyesight by using dioptre adjustment lenses over the eyepiece—though this is not quite so important with the fast wide angle lenses.

The increase in speed offered by a fast lens may only be one stop, or even less. Considering the high cost of these lenses, this small gain has to be sorely needed to justify the extra expense.

When buying a lens, there is often a choice between a normal speed lens and a fast model made by the same manufacturer. Before deciding, try using your standard lens at each of the apertures offered by the lenses. You may find that, with the sort of photography you do, the extra speed does not make a significant difference in ease of focusing. If you are also unlikely to use the maximum aperture offered by the fast lens very often, the normal lens is probably perfectly acceptable—and the cost saving quite large. But if a bright viewfinder image or a high shutter speed is vital, and an extra stop would help significantly, then a fast lens may be essential.

It is for you to decide whether, given the type of photography you are most interested in, it is worth your while going to this extra expense.



Improve your technique

High key, low key

Choosing either a high key or low key approach to certain subjects can influence the whole atmosphere and mood of your pictures

In most photographs, there is an even range of tones from dark to light—a picture that shows a dearth of dark or light tones is generally under- or over-exposed. But by deliberately tipping the balance towards dark tones, you can produce a rich, moody *low key* picture. By keeping tones predominantly light, on the other hand, you can create a cool, delicate *high key* effect. To get the best from both high and low key shots, though, you must choose your subject carefully and use special lighting techniques.

For an effective high key shot, you must choose a subject that is very light in colour: for a low key shot, the subject must be dark. But the lighting must enhance these qualities. High key lighting is very flat and soft, with few shadows, whereas low key lighting is selective, and only the principal area of interest is brightly lit.

Traditionally, black and white film has been used for high and low key photographs, because it offers the photographer more control over the tonal range and contrast of the final image. Nevertheless, high and low key images can be equally effective in colour. For high key work in colour, you must be careful in your selection of subject matter, because the high levels of lighting show up every slight difference in colour. Essentially, high key shots should have only one or two main colours—white is particularly suitable. Low key lighting, however, tends to disguise colour differences, and looks effective in colour.

High key treatment

High key effects can only be achieved with subjects that are predominantly light in tone—small patches of darker tone, such as dark eyes on a nude, do not matter too much, and may prevent a high key picture looking pale and insipid.

Popular subjects for high key shots are nudes and portraits, particularly where the sitter has blonde or light coloured hair, but still lifes can be equally effective. Room interiors also work well if they are very pale and sufficiently brightly and evenly lit.

Out of doors, high key pictures are much more difficult to take because there is less control over the lighting and

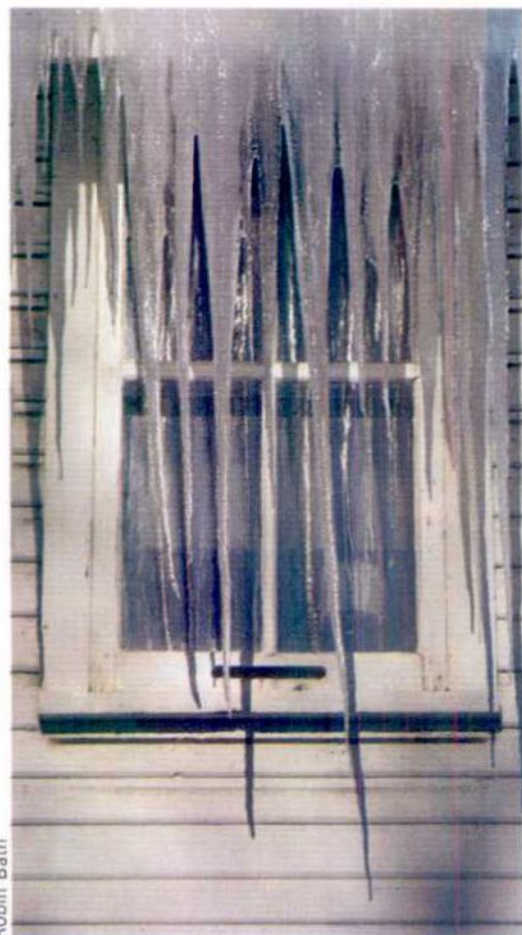
subject matter, but it is possible to produce effective landscapes under the right conditions. A fall of snow, for instance, can obliterate most dark tones from a landscape, and provide an ideal opportunity for high key pictures. Sand dunes and desert scenery also have possibilities.

Avoid any subject, indoors or out, that has large areas of dark tones. This more or less rules out dark-haired models, or at least makes the posing of them very difficult.

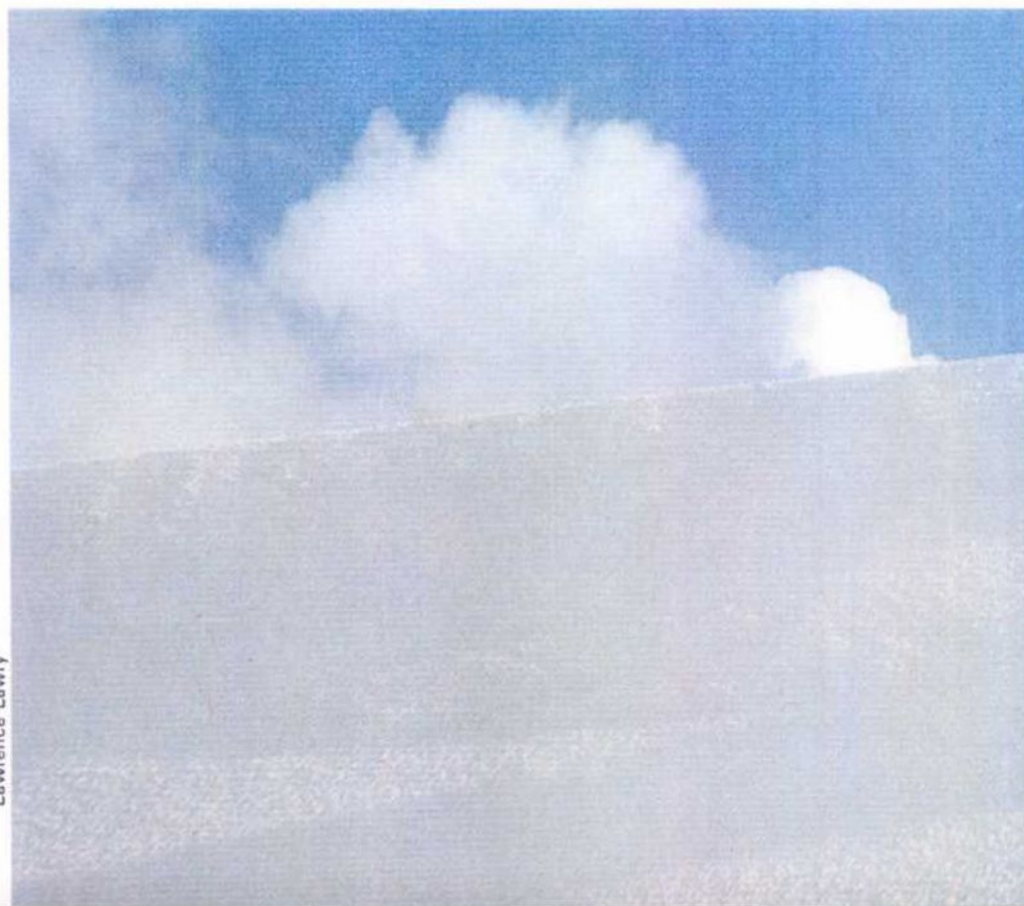
It is sometimes possible to conceal areas of dark tone by using *diffusion filters* on the lens (see pages 93 to 96). Because these spill light from the high-lights into the shadows, they emphasize the high key effect, and work particularly well with figure studios and misty, romantic portraits.

Backgrounds for high key studio pictures must be similarly light toned. Seamless white paper makes an excellent background, providing there is enough space between the main subject and the background to light the background separately and eliminate shadows.

Winter whiteness Cold weather is ideal for high key pictures. Obtrusive dark areas are blanketed by snow and ice, so it is an easy matter to shoot high key pictures out of doors. Best results are produced in overcast weather, when the shadows are soft and subdued—this is an important element of a high key treatment



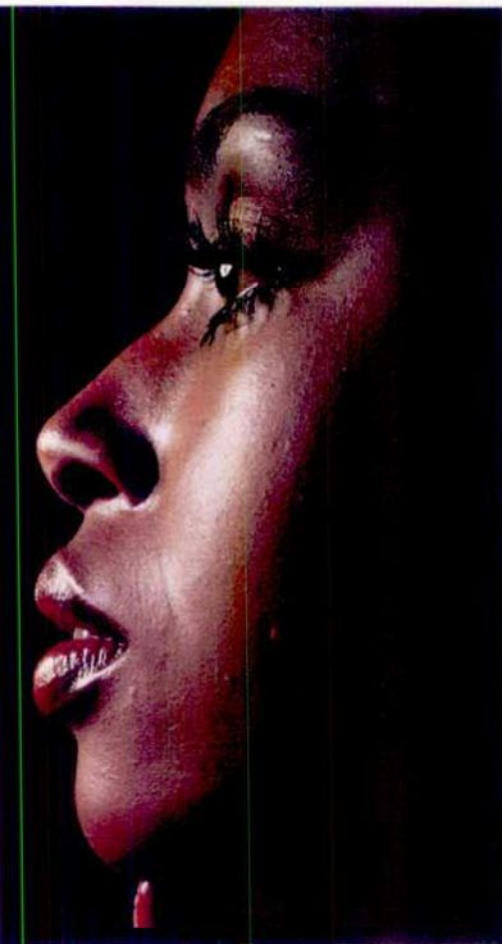
Robin Bath



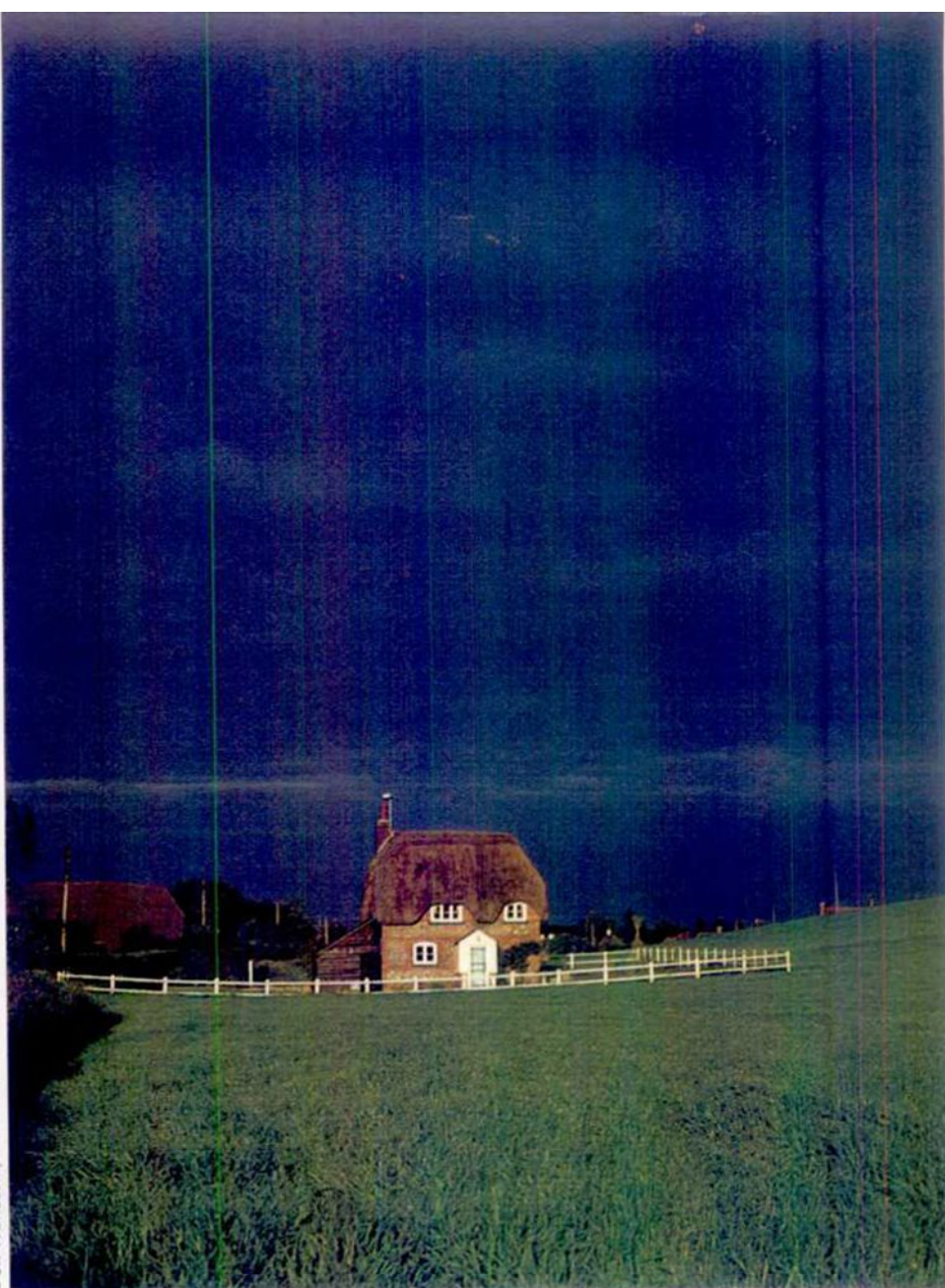
Lawrence Lawry

Dark landscape The subdued colours and dark skies that you sometimes see after a storm provide a perfect opportunity for low key landscape pictures

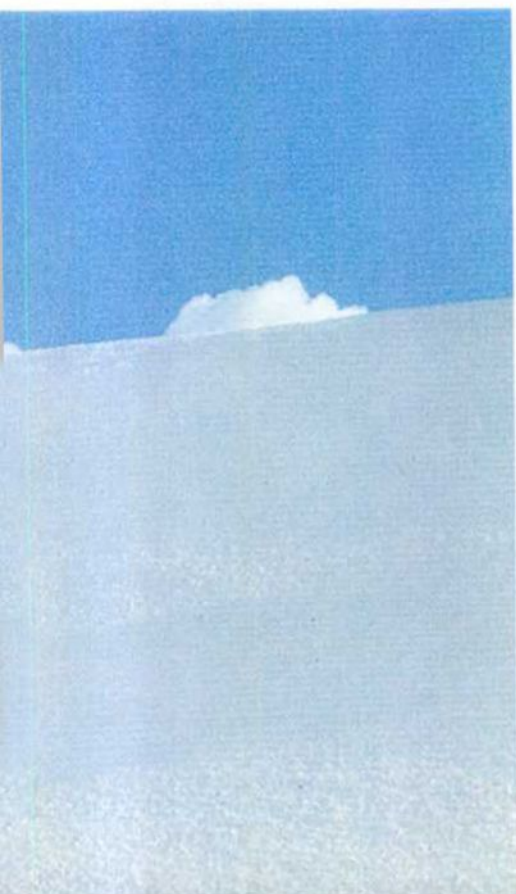
Low key look A low key treatment works well for people with black skin, but it is essential to use a hard light source to put in bright highlights



Don Hunstein/Colorific



Ann Kelley



Alternatively, work in a room with white walls and, ideally, white or near-white floor coverings. Dark-coloured fitted carpets, or a dark wood floor can easily be covered with a white painted hardboard sheet. Try to keep all the props for the picture pale in colour too.

Setting up the shot

With the subject chosen and a suitable background arranged, you must carefully light both subject and background to emphasize their pale colour. The idea is to eliminate virtually all shadow from the picture, leaving just enough to give an impression of shape and form.

Place the subject well away from the background and position the key light—the main light source—quite close to the camera, at about 30° to the lens axis. This keeps the shadow areas smaller than they are when the light is farther out to one side. The key light can be quite small, and a photoflood bulb in a 20 cm reflector is perfectly adequate.

The next stage is to use a second, much softer light source to fill in the shadows created by the key light and give the short tonal range characteristic of high key pictures.

This fill-in light must provide much more gentle, even illumination than the key light. A large matt-white reflector with a cap to cover the bulb is ideal, but there are other ways of softening the beam from a tungsten lamp. One way is to use a normal small reflector, and bounce the light from a large sheet of polystyrene or white card. Another alternative is to stretch two layers of tracing paper (or specially made diffusion material) over a wooden frame, and use this in front of the light to diffuse its beam. Either of these techniques produces the soft, flat lighting that is needed, even from quite a small light source.

Move this second light source around until the shadows from the key light are just visible. But avoid moving the second light so close that it creates its own shadows.

Finally, light the background to bring it up to approximately the same level of brightness as the main subject. You may be able to do this using only one light, placing it in front of the background and above it, just outside the picture area—if the background is very large, though, two lamps are needed, one at each side.

The level of light for the background should be either slightly darker, or slightly paler than the main subject. If both subject and background are exactly the same brightness, the two will merge together, and the contours of the subject will be lost. Use an exposure meter, and check that there is a small difference in brightness between the subject and its background.

Proper exposure is essential for high key work but it can be difficult to achieve, because a normal reading with a TTL meter would lead to under exposure. Since the subject is pale in colour and reflects a great deal of light, a reflected light reading would indicate too little exposure (see page 544).

For correct exposure, an *incident light* reading is essential—that is, a reading for the light falling on the subject. This should ideally be made with a hand-held meter with a plastic diffuser dome in place. To take the reading, stand directly in front of the subject and point the meter at the camera. If you do not have a separate meter, and rely on the TTL meter in your camera, use an 18 per cent grey card, and take a reflected light reading from this. You should get the same result as you would from an incident light meter.

Whichever method of metering you use, it is a sensible precaution to bracket the pictures—in addition to the indicated exposure, make exposures at half stop intervals for two stops either side. This way, you have a number of negatives or transparencies with slightly different densities from which to choose. If you are using black and white film, bracket at one stop intervals.

The film should be processed in exactly the same way as usual. Do not be alarmed by the appearance of the film as it comes out of the developing tank—negatives look very dense, and slides seem to be overexposed. This is what constitutes a high key picture, and as soon as you examine the images carefully, you will see that all the detail has been retained.

Low key pictures

Low key pictures need a generally dark toned subject, but if there are any pale areas in the subject or background they can often be concealed in shadow. The range of subjects suitable for low key treatment is therefore greater than that for high key pictures. In particular, it is relatively easy to achieve a low key effect out of doors, particularly when there is plenty of dark foliage in the picture.

However, before you aim for a low key image, make sure that it will suit the subject—it is easy to produce low key pictures that are inappropriately sombre and funereal, and have rather a depressing air. Only use a low key treatment if the subject is sufficiently full of life to override this, or if you are deliberately trying to conjure up a forbidding mood.

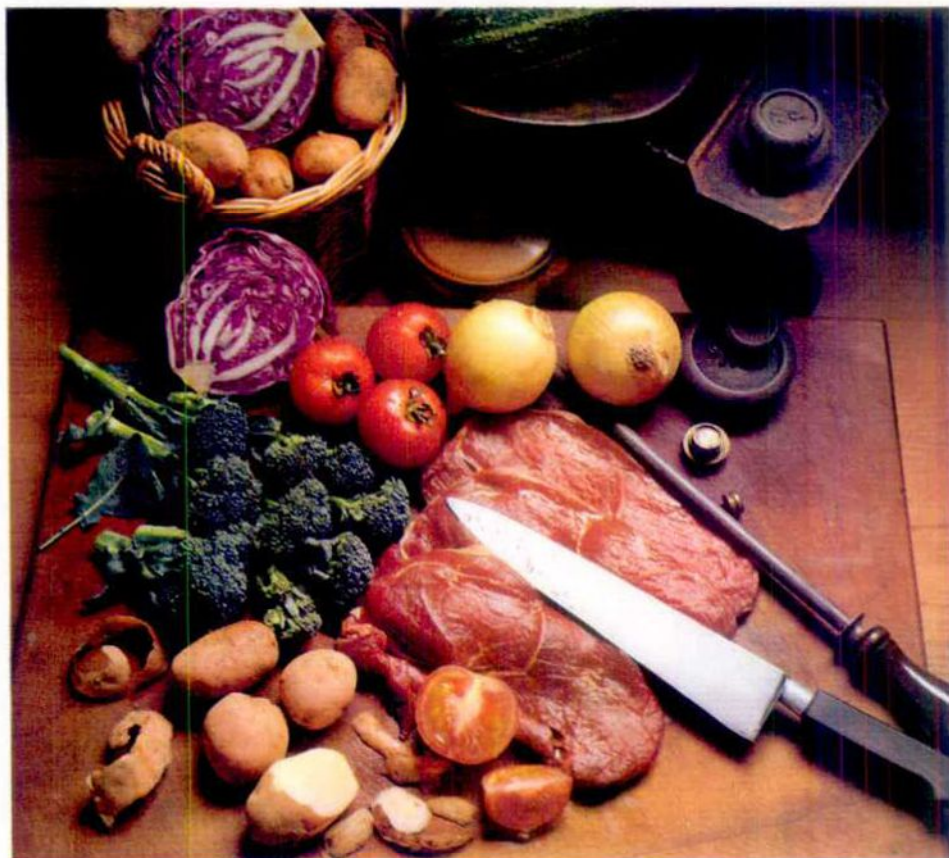
A low key picture is more difficult to light than a high key one, because the

approach must be varied to suit the subject. Ideally, there should only be a small bright highlight—usually on the main part of the subject—and detail should be just visible in the shadows. Shape and form should be just suggested and hinted at, rather than being emphatically stated.

Where texture needs to be emphasized—with fabrics, for instance, or a wrinkled face—a small hard light source should be positioned to bring out surface

detail. If texture is to be subdued, softer lighting may be more suitable, and light should be placed closer to the camera. In both cases, though, lamps should be shielded so that light does not spill into areas which are to remain in shadow.

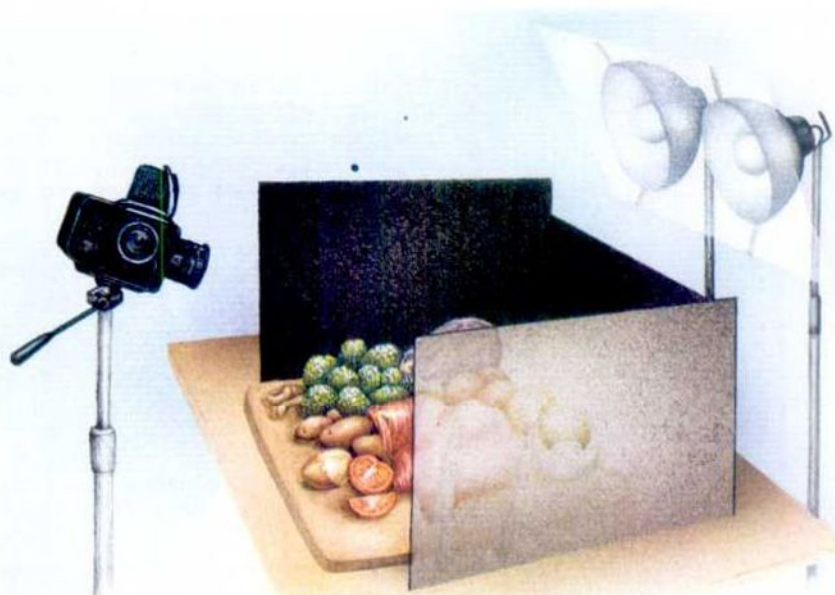
The main source of light is used to create the highlight, but the rest of the picture needs to be lit by a very low intensity light source. This should just be bright enough to produce detail on the negative, or to lift the dark



Roger Payling

Low key lunch The lighting for this still life was very simple. The photographer used only one light source, a sheet of tracing paper lit from behind by two powerful floodlights. The rich shadows that are a

characteristic of low key lighting were created by shading the set using large pieces of black card. The centre of the picture was left unshaded and is much more brightly illuminated



Oxford Illustrations



portions of a transparency away from a solid black tone. This overall illumination should be softened by bouncing the light off a white umbrella, or a sheet of white card or polystyrene.

Once you have arranged the main light for the highlight and a second, soft light for the overall exposure, stand back and look at the scene. If the shadow areas look too muddy and dark, you may need to provide gentle rim lighting to provide some separation of the planes in the picture. This can be sidelighting, backlighting or toplighting, set so that the light just catches the perimeter or the subject, but does not illuminate the shadows—if the rim light is overdone, the low key effect is lost.

Exposure readings for low key pictures should be made in the same way as for high key, using the incident light method, or a grey card. Remember, though, to take the reading from the fully lit part of the subject, and not from the shadow areas. Since low key lighting is even dimmer than high key, this is very important—bracket exposures to ensure good results.

If your technique is right, you should be able to process and print low key pictures in the normal way. Shadow detail is important, though, so if you are printing in black and white, concentrate on the shadow areas of the print.

High and low key treatments are, first and foremost, creative techniques. They are not an end in themselves, and they become monotonous if used over and over again. Not all subject matter benefits from either of the two techniques and you need to use some discretion when picking out what to photograph. Nevertheless, with the right subject, either treatment can produce an exciting, unusual picture.

Roger Payling

High key head

For this picture, the lighting was much more complex. The main light was the same sheet of diffusing material, but this time placed directly above the camera and lit by two photofloods. Plenty of soft fill-in lighting was provided by bouncing the light from two more floodlights off the white studio walls. The background, a roll of white seamless paper, was lit by floodlights on either side. Finally, a small floodlight on a boom was positioned above the model's head to lighten her hair still further, and this was covered by tracing paper to soften its beam. To prevent a deep shadow forming under the chin, the model held a large sheet of white polystyrene, which acted as a reflector, throwing some of the light up into her face.





Darkroom

B&W reversal

Monochrome transparencies have deeper blacks and brighter highlights than prints. By reversal processing black and white film, you can produce your own high quality reversal images

To most people, the term 'transparency' means a colour image on reversal film. However, monochrome transparencies have been made since the earliest days of photography. Although the process is little known, it produces beautiful black and white images which are superior to prints and require nothing more than basic film processing equipment.

Because monochrome transparencies are viewed by transmitted light rather than reflected light, they can render a far greater tonal range than any print can ever do. They generally show a rich tonal graduation from full shadows to bright, clear highlights, while the image is often of very high quality.

Monochrome transparencies are made using ordinary black and white film, which is processed specially to produce a reversed, positive image. There are special kits available for reversal processing black and white film, and there is in fact no cheaper way of producing a high-quality photographic image, because there is no enlarging or printing involved. Although any film can be used,

best results are generally achieved with slow, fine grain emulsions.

As well as its low cost and excellent image quality, a black and white transparency has the added advantage that you can show it to large numbers of people simultaneously, which you cannot do with a print. You can also use black and white slides to make titles for slide shows, by copying lettering.

The chemicals for black and white reversal processing are available in kits from photographic chemical manufacturers, and should be available from your usual supplier.

Exposure

It is important, when shooting pictures which you intend to develop into monochrome transparencies, to make sure that your exposure is as accurate as possible. Unlike prints, transparencies cannot be corrected in printing, so for the best results your exposure should be absolutely correct.

If you are accustomed to using colour transparency films, then you should not

have much difficulty with black and white transparencies, as the exposure latitude is the same for both types of film. Nevertheless, since exposure also depends on the chemicals you use for processing, you should buy the processing kit before shooting, and read the instructions carefully.

As a general rule, it is advisable to follow the exposure recommendations on the kit at first. However, as your metering technique or processing conditions may differ slightly from those of the manufacturer, you should expose and process a trial roll of film before you take any serious pictures.

Some manufacturers claim that their kits increase the effective speed of films. You should also test this out when you shoot your test film. On the whole, when exposing a film for reversal processing, you should expose for the highlights,

Rich tones Subjects like this are especially suitable for black and white reversal, because their density range is reproduced in rich, full tones



Ed Buziak



Simon Jones



Still life *Agfa Dia-Direct gives warm, rich tones and reproduces detail well*

Imitation Tudor *Reproduced from a Kodak Panatomic-X film, reversal processed*

rather than the shadows. In other words, slightly underexpose your film every time you have any doubts about exposure, to avoid pale, bleached-out highlights.

The reversal process

Normal black and white processing produces a negative image in the form of black metallic silver. The unexposed emulsion is made soluble by the fixer, and is then washed away.

In reversal processing, the aim is to remove the black silver from the negative, and then blacken the previously unexposed emulsion. This is done in the same way for black and white as for colour (see pages 578 and 579), by bleaching out the first, negative image, re-exposing the film to light, then developing and fixing the remaining emulsion.

You need little more equipment for black and white reversal processing than is required for negative processing: a developing tank, at least four chemical storage bottles, a thermometer, a sink, clips for hanging film to dry and a timer. You will also need a pair of rubber gloves, because the bleach used in reversal processing is both corrosive and poisonous. You should wear rubber gloves throughout processing, and never let the chemicals come into contact with your skin. All chemicals should be stored out of reach of children. As some plastic developing tanks tend to leak after the first processing stage, be sure that you are working over a chemical-resistant surface, and be sure to wipe up any spilt chemicals immediately.

Processing is not difficult, but it is time-consuming and requires careful control of processing temperatures. The temperatures of both the first developer and the bleach must be carefully monitored. The best way to do this, if you do not have a processing machine (see page 895), is to fill a sink with water at the processing temperature, and to stand your bottles of chemicals in it. This ensures that your processing temperature is correct throughout.

Processing times vary from one kit to another, and you should follow the

instructions on the pack closely. Processing temperature is usually 20°C, but here, too you should follow the manufacturer's advice.

The first developer is usually given plenty of time to work on the film, because all the silver halide must be developed fully to prevent it from affecting the final image. Transparencies should ideally be rather more contrasty than negatives, to give a good density range when projected, so the first developer is an active, high-contrast type. Some processing kits are sold without a first developer, and their instructions usually suggest that a print developer should be used for the first development stage.

Ideally, the first developer should contain a mild silver solvent to reduce the fog level of the final slide. Most black and white negative films have a tinted

Girl in profile *This shot, taken on Ilford Pan F, shows good detail and a wide density range. Enlargment (below) reveals a moderate amount of grain*



Steve Ballantyne



Bay window This was taken on Agfa Dia-Direct monochrome reversal film, and shows the characteristic high quality



Simon Jones

obtainable with this film. Only when the image is greatly enlarged does the extremely fine grain become visible

base to reduce halation, and this means that such films cannot give as bright an image as films with a clear base. Usually this is not a problem, since it is possible to shine enough light through the film when the transparency is projected, but reducing the fog level is a precaution worth taking.

After first development is complete, which is normally after 15 minutes, pour out the developer and give the first wash. You are now ready to pour in the bleach. Timing is very important at this stage, and to obtain good results you must be accurate. Do not bleach the film for too long, as this may affect the undeveloped silver halides.

Some processing kits follow the bleach with a special clearing bath, while others rely on a thorough wash. The clearing bath neutralizes the bleach, and helps ensure consistent results.

Re-exposure

After the wash or the clearing bath, reversal processing departs radically from negative processing. Open the developing tank in normal room light, and remove the film spiral. You must now re-expose the film to develop the remaining silver halides. This is best done by holding the film in a spiral close to a lamp for a minute or two in the same way as for Agfa colour reversal processing, (see page 895). Most plastic spirals are translucent, so the film need not be unwound, but if you have a stainless steel spiral, you must unload it, removing the film very carefully. Luckily, stainless steel spirals can also

be reloaded when wet.

When you have re-exposed the film, return it to the processing tank for the remainder of the process. Like first development, second development is carried out thoroughly to turn as much exposed silver halide as possible into metallic silver.

This step is followed by a wash and an ordinary hardening fixer. Then give the film a final wash, add a little wetting agent and hang it up to dry in the usual way. Be careful when hanging the film up, as the lengthy immersion in processing solutions is likely to leave the emulsion softer than usual, and so more vulnerable to damage from scratching or small pieces of grit.

Once dry, the film can be cut up into its separate frames and mounted in transparency mounts.

Results

Results vary slightly, according to film emulsion and the processing kit used. Slower films often give a slightly warmer image than faster ones, but this is usually attractive, and a brownish-black tone suits many subjects.

Slides which are too dense or too light are usually the result of incorrect exposure, but the length of the first development time can also influence density. Slides that are too light and contrasty may have been overdeveloped, while flat, dark slides have usually been underdeveloped. Staining or density variations are probably the result of inadequate washing between processing steps.

Other methods

You can also make black and white transparencies without a reversal processing kit. The easiest way is to use a roll of Agfa Dia-Direct, a 32 ASA film which is sold with processing included in the price. You expose your film normally and post it to the Agfa processing laboratories, who will reversal process it into fine grain, high quality transparencies. The film has a lighter coloured base than most conventional b & w films, so the slides are as bright as colour transparencies.

Another method which does not require reversal processing is to contact print a negative on to fine grain positive film. This technique is covered in a subsequent article.

Printing transparencies

You can either print your transparencies on Cibachrome, or you can reversal process bromide paper. Tetenal make a kit for reversal processing plastic coated monochrome paper. To avoid chemical contact with the skin, you should use a print processing drum. Alternatively, you can print on Cibachrome in just the same way as with colour transparencies, adjusting filter combinations for many different creative possibilities.

You can also add colour to your transparencies by using toners or tints. Using a fine brush and a magnifying glass, you can even add more than one colour, producing very attractive tinted images with all the brilliance given by transmitted light. This technique is also covered in a subsequent article.

Creative approach

Rain

Do not be discouraged by the prospect of a rainy day.
Take your camera out and discover the potential
of marvellous images in wet conditions



The most interesting photographs are not necessarily those which are taken in bright sunshine. Unfortunately, most photographers regard the first few drops of rain as a signal for them to take to the darkroom, or even to forget about photography altogether. This is a pity, since a rainy day is actually a very good time to achieve those subtle and occasionally dramatic effects which are just not possible when the sun is shining over your left shoulder, in the accepted fashion. Once you decide to brave the rain, with waterproof boots, a raincoat and some protection for your camera, you will find that many creative possibilities for photography exist.

Everyone has a different image of rain in their mind's eye. Quite often these images will be very evocative of a mood, a place or a way of life. It is a challenge to capture such images on film, and to recreate the very feeling of rain for whoever views the picture. Rain can vary from soft, permeating drizzle to the streaming torrents of a monsoon, so there is a wide variety of possible images.

Rain itself can be hard to photograph. Our visual impression of rain includes its movement, and even though we do not see individual drops, we can perceive it falling even when it is such fine drizzle that the familiar streak effect is not apparent. A photograph taken under such conditions would show nothing of the rain, and even what the eye sees as obvious rain may not register on a photograph as anything more than a general mistiness.

Heavier rain, however, will show up in a photograph as streaked lines, though the exact image will depend on the focus point and the depth of field. With a restricted depth of field, the streak effect may be less apparent than when a wide range is in focus.

We usually look towards a dark object to establish how heavily the rain is falling, and the same is true if you want to portray the rain in a photograph. The most realistic impression is often gained by showing the rain as short streaks, but this effect requires a surprisingly fast shutter speed, generally difficult to give because of the dimness of the light. And unless it is raining very hard, you may find when you see the picture that there were very few raindrops close enough to the camera, or within its depth of field, to register in this way.

Using electronic flash, either at night or as fill-in, it is possible to isolate individual raindrops as they fall. But this may give an effect quite unlike rain. The few drops that are close enough to the camera to be seen clearly may be overexposed, while farther away the drops merge into a general mistiness.

Pictures which feature the rain itself are probably most effective where there is an additional subject fairly close to the

Rosebud Leaves and flowers look fresh and sparkling after rain, when tiny beads of water cling to their surfaces, and it is well worth taking close-ups

Ian Bradshaw/Colorific

camera on which you are focusing. Then you will be restricting the depth of field to the general vicinity of your subject, and the rain itself will be apparent to the camera. Typical subjects include people forced to stand in the rain, or just sheltering from the rain in a doorway or under a street market stall's awning.

In general, you may find it more rewarding to picture the effects of rain rather than the rain itself.

One of the most attractive qualities of a rainy day is the transformation that occurs when everything becomes wet. Even the most mundane surfaces, such as the pavements, become shimmering, glistening pools of reflected light. The many different types of reflections created by the water are subjects in themselves and you could spend your rainy day absorbed in photographing these. Look, in particular for buildings, cars, or street lamps reflected in the surface of a pavement. Rough surfaces, such as a cobbled street, where the water gathers unevenly, create interesting broken up, impressionistic reflections. Normally still water, spattered with raindrops, will have almost the same effect. If you focus just on the surface of the water, the possibilities of playing with the reflections presented to you in a creative way are practically endless if you think carefully.

Such conditions often occur in showery weather. The sort of pictures you take will often depend on the nature of the rain, and showery weather in particular provides many opportunities for photography. There is always the chance of a sudden downpour which will create considerable panic in the streets. People run for cover, struggle with umbrellas and rainhats, gutters overflow into temporary waterfalls, and cats retreat disdainfully to the nearest doorway, while children seem to be the only ones to react with excitement and exuberance. Toddlers, in particular, and regard-



Adam Woolfitt/Susan Griggs Agency

Open air concert *A rainy day is a good time for candid pictures, and may produce some amusing images*

Window *A normally dull view may appear to be much more attractive when seen through a screen of pearly raindrops*

less of their footwear, usually rush gleefully to jump in the nearest puddle. See how the spectators at a sporting event cope with an unexpected shower as colourful umbrellas and makeshift headpieces appear as if by magic. Generally, people are so preoccupied with preserving their dignity on these occasions that they fail to notice what amusing subjects they make for the candid camera.

Awnings and trees have their own ready-made source of pictures in rain—they usually have a good supply of unexpected large drips to catch out the unwary passer by. Wait patiently and unobtrusively to catch the expression of disgust as someone receives a drip down the back of their neck.



John Goldblatt/Vision International



Vautier/de Nanxe

As you become aware of the rain as a subject for photography, you will notice that there are actually many different types of rain. A very thin drizzle can be entered bravely, with your camera protected by a plastic bag. This type of rain acts as a soft screen between you and your subject, and the effect is roughly similar to that given by a soft focus filter. On the other hand, a heavy monsoon-like downpour may be too much for the plastic bag, and it is best to photograph from some sort of shelter.

A rainy day often requires fast film, since the light level will be very low in a real downpour, but do not try to give too much exposure or you will destroy the

Rickshaw *Very heavy rain can be shown as streaks with a fast shutter speed, but is best photographed from shelter*

pictures can be achieved by concentrating on details and close-ups such as these. Note how the colours of flowers or leaves, for example, change when they become wet. See that, in close-up, the individual droplets distort the surface of the subject beneath, and act as miniature magnifying glasses. Look out for the reflective quality of the water, which in strong light brings myriad highlights in to play.

Another effect often seen after rain has just passed is the rainbow. These

Lights *Night lights in the rain, photographed through a window, form blurred, abstract images*

Sky *A dramatic skyscape often precedes a cloudburst, and in open country it is revealed at its best*

John de Visser



John de Visser



heavy mood which accompanies such rain. Fast film has the drawback of giving less vivid colours and lower contrast, which may result in disappointing pictures. Look for brightly coloured objects as a contrast, such as yellow mackintoshes, red traffic lights or bright green leaves. When the rain is falling fairly fast, people automatically put their lights on to compensate for the lost daylight, whether car lights or domestic lamps. You can use these to great effect in your photographs.

A rain storm is not the best place for a camera, and although a few drops of rain on the casing or lens filter will do no harm, you will probably prefer to carry out your rain photography from shelter. Raindrops on a window are a classic subject, either in their own right as a close-up, or as part of a picture with

someone looking out at the rain.

The few minutes after heavy rain has stopped are frequently a rewarding time for photography. This is the moment when you sometimes see a shaft of sunlight breaking through the tail end of the storm clouds, and when the possibilities of extraordinary backlighting effects must be grasped before the combination of wind and sun dries everything out. Droplets of rain hanging on to branches, leaves, flowers and spiders' webs, for example, make attractive photographs, particularly when backlit so that the water glistens on the subject.

With these smaller subjects, it is worth taking a close-up shot, throwing the background out of focus, so that the maximum attention is given to the effect of the water. Some of the most exciting

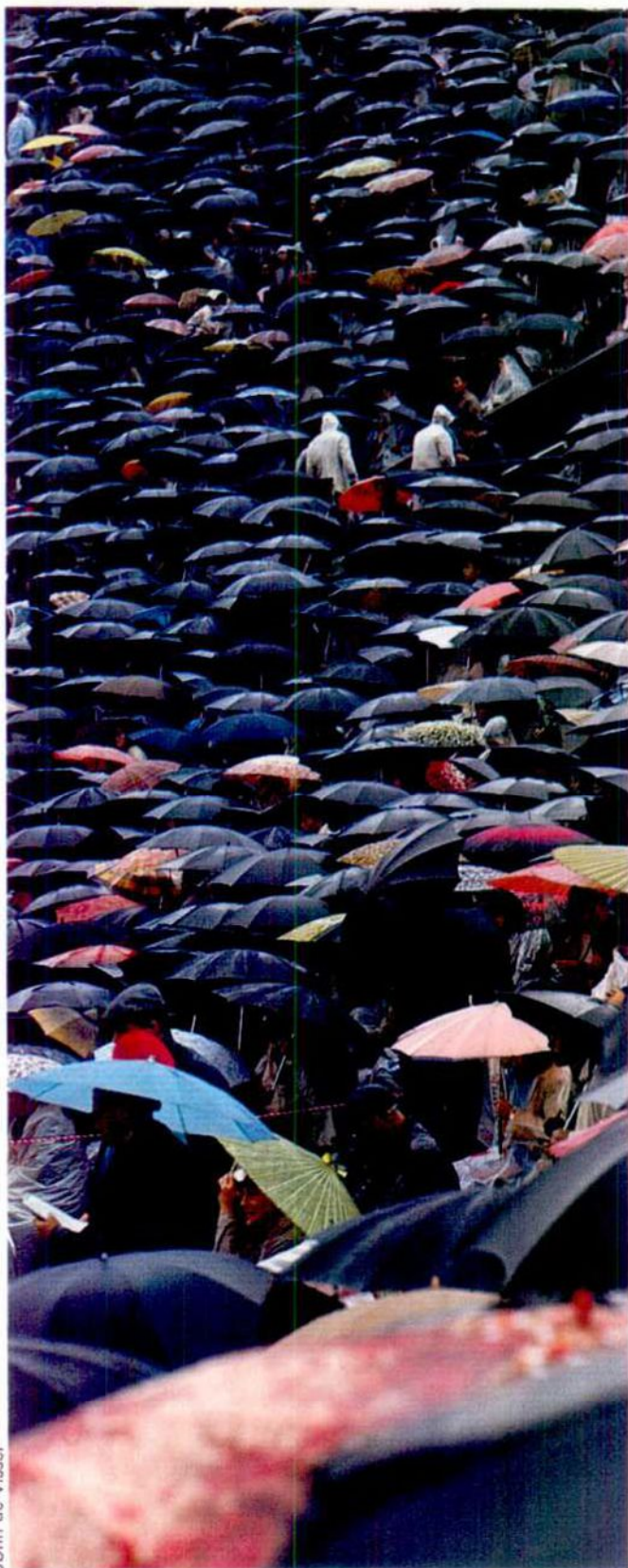
occur when a fairly low sun shines on rain, and are visible opposite the sun in the sky. They are most effective when seen against dark clouds.

Rainbows often last a short time only, so it is not possible to select your viewpoint at leisure. But by knowing the circumstances in which they appear, you can be on the alert and watching for a good opportunity to take the picture. A wide angle lens will help to show the curvature and any inner or outer bows, while a telephoto can be useful for concentrating on the place where the rainbow is seen against ground features, lending them eerie colours. You can give a normal meter exposure when photographing a rainbow, though half a stop of underexposure may heighten the dramatic effect and emphasize the colours dramatically.

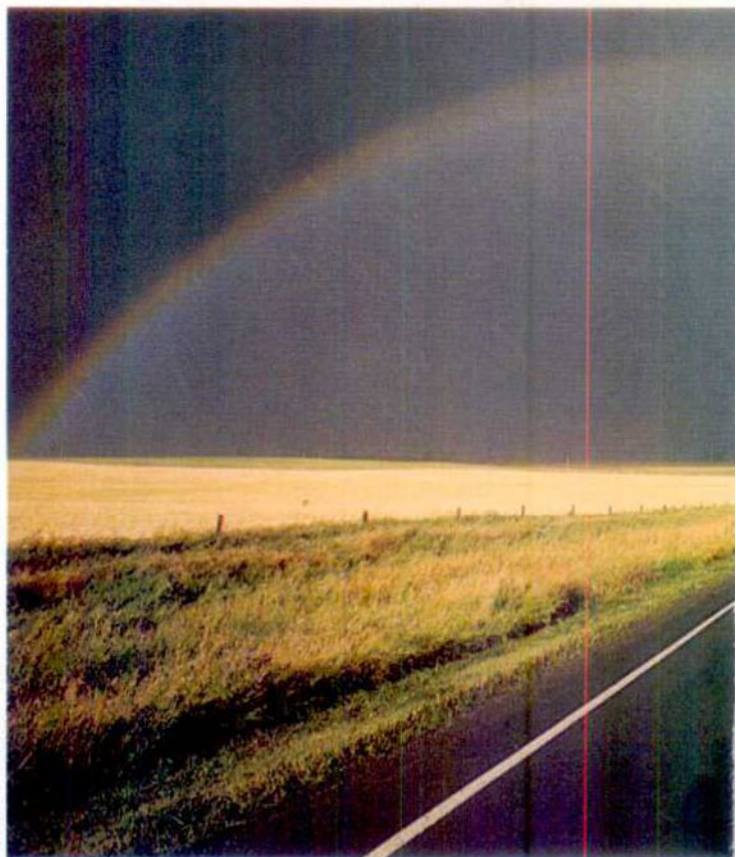
Umbrellas The two figures in raincoats provide a centre of interest among the sea of umbrellas—they not only stand out but lead the eye in to the picture

Rainbow Capture the sweeping arc of a rainbow with a wide angle lens. Here the leaden sky and dark road provide a dramatic contrast to the rainbow itself

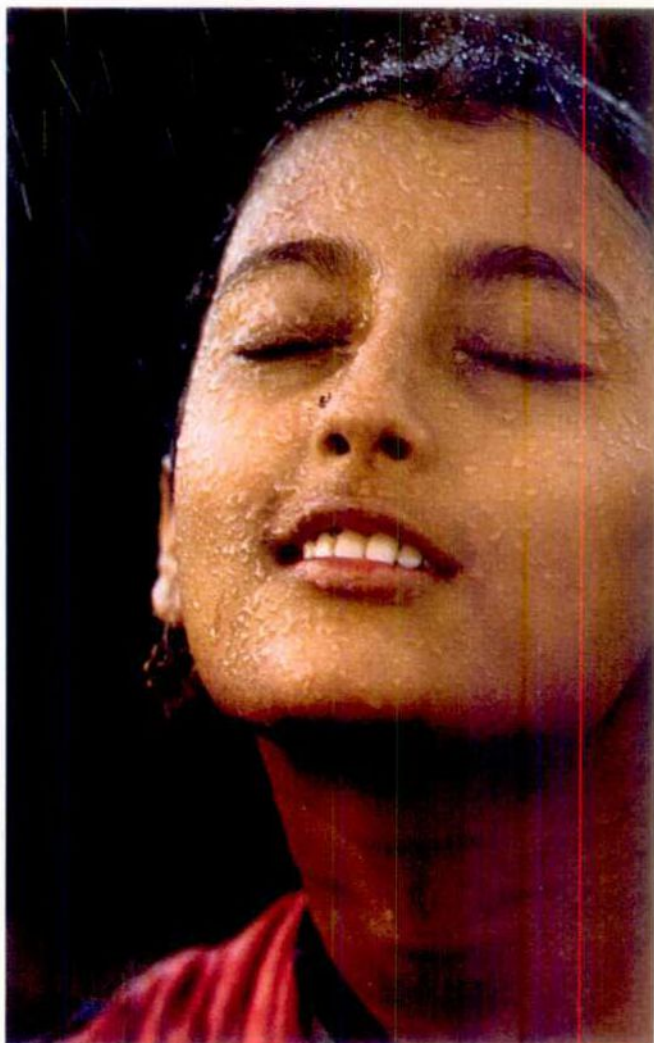
Portrait Try to capture the rare moment when someone is enjoying the rain. This classic shot combines the delicate droplets on the face with sharp streaks behind



John de Visser



Albert Fenn/Colorific



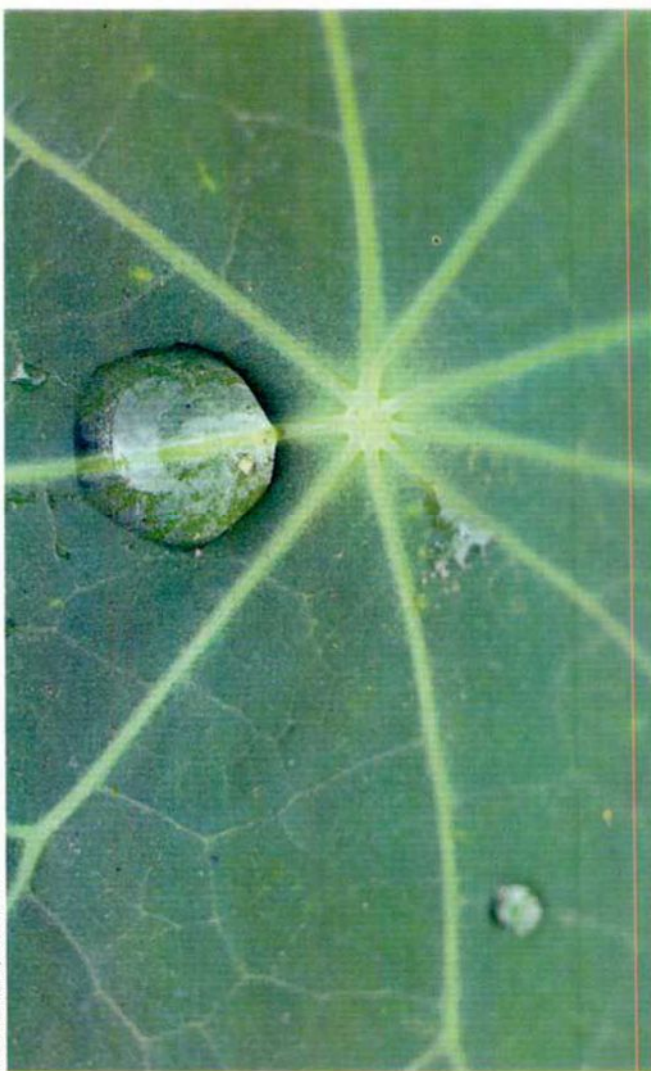
Brian Brake/Photoresearchers Inc.



Leaf When you take a close-up of a raindrop, you can glimpse minute detail beneath the water, which acts as a miniature magnifying glass

Red umbrella Careful framing enhances the solitary mood of this passer-by. The bright umbrella provides the only accent of colour in an otherwise grey picture

Alan Clifton/Colorific



Reflejo/Susan Griggs Agency



Alternatives to tripods

Camera shake can spoil pictures taken under a wide range of situations. A simple camera support helps solve the problem, while being much less bulky than a tripod



Kim Sayer

Whatever type you choose, though, the great advantage of a camera support is that it will enable you to make the most of your camera and help you get the best out of a wider range of shots.

Clamps

Simple G-clamps fitted with a ball and socket head to which the camera is screwed are a popular form of support. They clamp on to any convenient object, usually at any height and at almost any angle, and may be made from metal or tough plastic.

Test a clamp before you buy it and ensure that it grips all types of surface, rough or smooth, very firmly. Ensure also that the clamp jaws open wide enough to fit on to a good variety of objects. Similarly, make sure that the jaws close snugly together and will grip even thin surfaces properly. Additional points to watch out for include checking the manufacture of the ball and socket joint and the quality of the jaw linings.

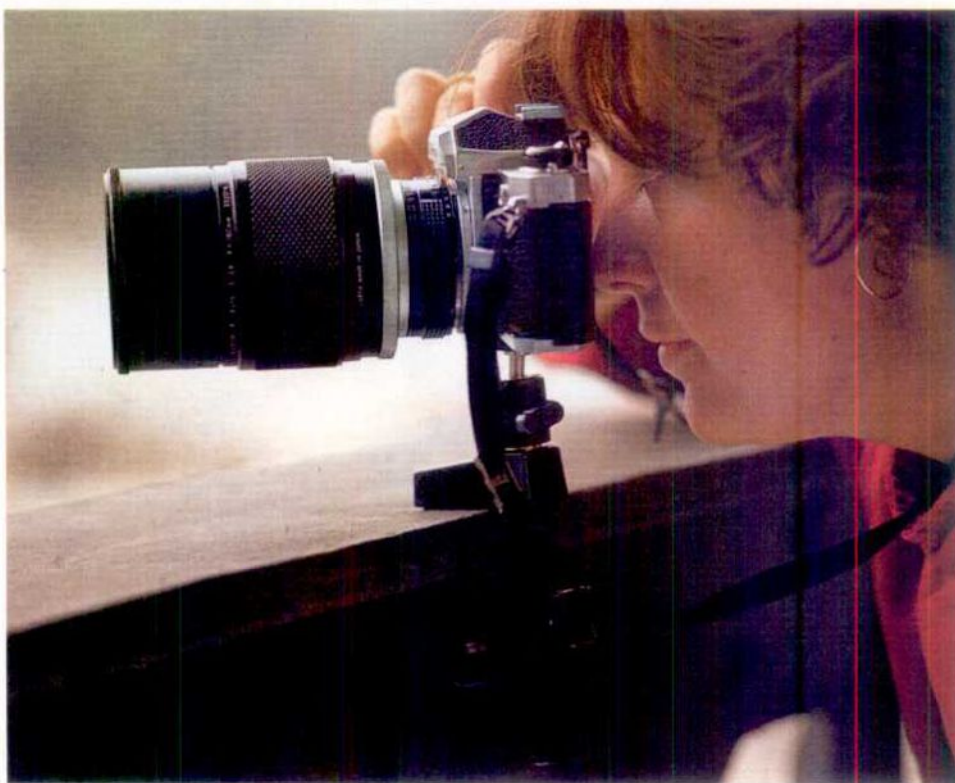
One of the most versatile clamp supports is a miniature scaffolding

Camera supports (clockwise from top): bean bag; tripod; suction clamp; clamp chest stock; screw; spike; clamps and shoulder stock. **Clamp** Make sure you attach your clamp to a firm object before you begin to shoot

Over half the shutter speed range on modern SLRs cannot be used if you limit your photography to taking only unsupported hand-held shots. Low light, slow films, small apertures and high magnification close-ups all call for long exposure times and unless you use some form of camera support, you may have to forego many potentially interesting picture opportunities.

Unfortunately, most tripods are too heavy, bulky and cumbersome to be carried around on every photographic expedition. Many photographers have a small table-top tripod for emergency use, but these are liable to overbalance when used with long lenses, which is when they are needed most. But there are alternative supports available which go some way to solving the problem of keeping the camera steady while being relatively small and portable.

Some such supports hold the camera independently, like a tripod, while others simply act as a steadying device while the camera is hand-held. Most are designed to be compact and lightweight and so, generally, are suited only to use with small cameras.



system which can be tailored to suit individual situations. This consists of slim metal tubes, joints, clamps and ball and socket heads. You can buy the system part by part as you need it, or, alternatively, in various sized kits. With this kind of system you can build special one-off supports to hold both camera and subject then dismantle it and set it up in a different way to suit another job. This kind of support is especially useful for macro work.

Clamp systems designed for professional use can be quite expensive, but they are well made and in some circumstances could be the only way of holding your camera and subject in the right position. You may be able to improvise a similar system using parts from laboratory stand equipment, such as that made for holding test tubes and flasks.

Clamps which mount on specific points are also available, such as those

which attach to car wing mirrors or dashboards. And these are particularly useful for taking unusual action shots or for converting the car into a mobile support.

Wing mirror clamps simply replace the mirror head and incorporate a ball and socket head. Used with a motor drive and cable release, the camera can be fired from inside the car (though not by the driver) while moving along.

Suction mounts, based on a large, powerful rubber suction pad, can be fixed to a dashboard so that you can shoot through the windscreen of a car. But you can also mount a suction pad on any smooth surface such as glass, car bodywork, polished wood, plastic and metal. Generally, suction pads are attached and detached with a simple on/off lever and have a powerful grip. Check suction pads in the shop by clamping them to different surfaces to test their security.

Spikes

Spike supports are similar to simple, short monopod-tubes and have either a daggerlike blade so that they can be pushed into firm ground, or a screw thread so that they can be screwed firmly into wooden fences or tree stumps. On no account should the latter type ever be used on living trees as severe damage to the tree may result.

Spikes are fairly short as they are used mainly for macro work on terrain where it is difficult to set up a low tripod satisfactorily. Some types, though, can be fitted with an extension tube to convert them into a type of monopod for wider applications.

Spikes have limited general use because they can only be used on softish ground, and if the ground is soft

Shoulder stock *An example of the more sophisticated type of shoulder stock, which gives a good degree of stability*



Kim Sayer

enough for a spike to be pushed in, the spike itself may be prone to wobble.

Not all compact supports need to be fixed to a base, either the ground or another solid object, to keep the camera steady. Among the alternatives are supports which simply aid the stability of the camera while it is hand-held. Of these, the most popular are pistol grips and shoulder stocks.

Pistol grips

Pistol grips, shaped as their name implies like the handle of a gun, are attachments which screw into the tripod fitting in the camera baseplate. They allow single-handed support for a camera fitted with a short to medium telephoto, but for a firmer hold the lens should be supported with the other hand. Used in conjunction with a motor wind and a cable release, a pistol grip will allow you to use longer than standard focal length lenses at fairly low shutter speeds without having to worry about camera shake. And it allows you greater mobility out in the field as it frees you from having to carry around other support

systems like tripods or monopods.

Look at as many types of grips as you can before deciding what to buy. Some types consist only of a solid plastic and metal grip which screws directly into the tripod mount, while others are more sophisticated and expensive, but offer a wider range of features. These include adjustable side-to-side grip angle, extension cradles to shift the centre of balance to below the lens, flash brackets and a built-in trigger to fire the shutter.

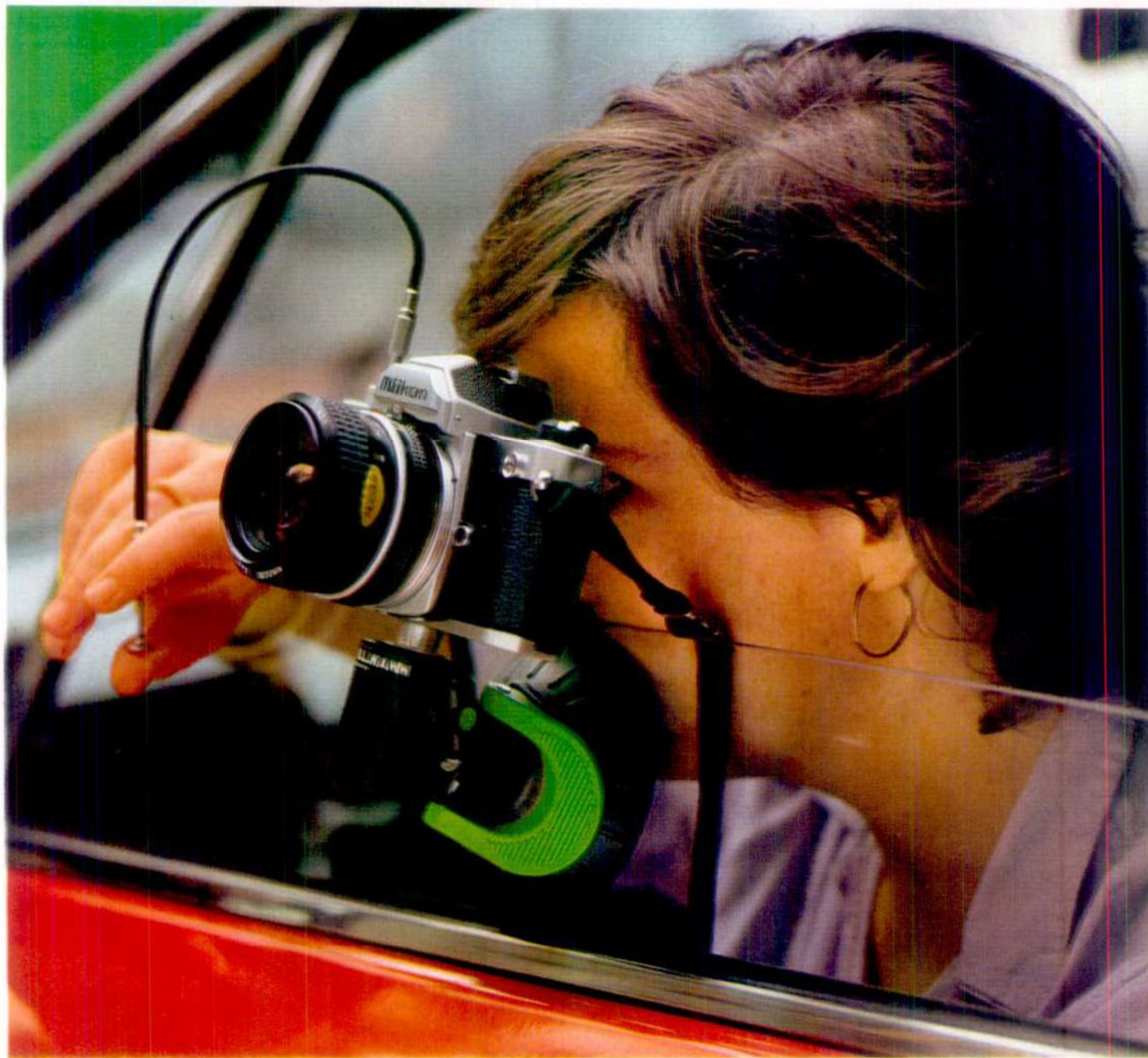
Shoulder stocks

If you regularly use a long telephoto or zoom, a shoulder stock may be what you need. Most are based on an extension of the pistol grip idea and offer even steadier support as the stock is held firmly against your shoulder or chest like a rifle butt. Some types have all the features, and more, found on a good pistol grip and can even be used with lenses over 300 mm. With a motor wind fitted to the camera and the integral trigger mechanism in the stock, you do not even need to release your grip between shots.



Spike A spike on a tube is useful for low-level work where you cannot easily set up a tripod. **Screw** Based on the same principle as a spike, a screw can be fixed to a wooden support and allows you to shoot from a greater height





Kim Sayer

Multi-purpose supports

Some of the most popular support accessories are those which have more than one function, but which are also light and small enough to put in your pocket or gadget bag. An example of this type is a G-clamp device which also acts as a pistol grip. Inside it are concealed three short extending legs that can be adapted to act as a tripod. You can also use some monopods as long pistol grips and there are shoulder stocks which convert into tripods or pistol grips. Unfortunately, the more versatile the support, the more likely it is that it will not perform all its functions equally well. When used as a mini-tripod, for example, a multi-purpose support may prove unstable.

Specialist supports

For special types of photography a few specialist hand-held supports are available. For example, some types hold two cameras, one above the other, so that

the same shot can be taken simultaneously on two different types of film or with different lenses. This type of support can also be fixed to a tripod. Other supports have two-handed grips with a double cable release allowing you to switch hands quickly and still fire the shutter without having to waste time adjusting your grip.

Cheap alternative supports

While all supports have something to offer in one situation or another, their overall value depends very much on how often they are used when weighed against their cost and, of course, the benefit to your pictures. But if you find you need a support only very infrequently, there are a few cheap ways of providing steady support to a hand-held camera.

Bean bags—small soft bags filled with small beans or lentils—are less widely used than other forms of support but can be valuable for some occasions. Their

Suction clamp *Ideal for attaching the camera to smooth surfaces which would give no purchase to a normal grip, this support must be securely attached*

advantage lies in the way such bags mould themselves to the contours of whatever they are placed on, and whatever is placed on top of them. But the disadvantage is that you have to find a fixed support of approximately the right height to begin with. Given this, though, a bag can be placed on a tree branch, for example, with a camera and telephoto pressed on to it. The bag will mould itself to the curve of both lens and branch and support the camera while you take the shot. Additionally, the soft material of the bag will protect your camera and lens from scratches that would otherwise occur if they were rested only on a rough support. Take care to angle the camera correctly when using such a support, and make sure it is resting on a firm, stable surface.

Understanding...

Instant film

Instant picture photography is now very popular. But to most people, the processes of film development remain a mystery. In fact, the methods involved are based on straightforward photographic principles

At first sight, instant pictures seem to have little to do with normal photographic processes. The prints are ready in a matter of seconds, generally without the usual sort of negative. Some types of

A conventional light sensitive emulsion is coated on a film base, and it is this which is exposed in the camera. Opposite this is a receiving layer on a paper base which is not light sensitive. After

silver to deposit out, giving the positive image.

At the end of the processing time the two layers are peeled apart, and the negative part, which is of no further use, is thrown away.

called dye-developers, as they act as developing agents when the reagent is introduced into the print. This time the reagent is not a developer, but simply an alkali.



film even develop as you watch in daylight. In fact, instant picture films use a number of conventional photographic principles, though in a unique way.

Two types of film are used—peel apart and dry film (see page 802)—and both use normal silver halide emulsions. The colour processes use yellow, magenta and cyan dyes to form the final image, as with normal materials. And although the methods of arriving at a positive picture vary, all involve the forming of an initial negative image.

Monochrome materials

The basic principle involved is that of *diffusion transfer reversal* (DTR), where image reversal occurs by transfer of the image from one surface to another. This principle can be clearly seen in black and white materials which are of the peel apart type.

exposure, the complete package containing these layers and the chemicals is pulled out between pinch rollers. This action bursts a *pod* containing a chemical known as a *reagent* and presses the layers together.

The reagent, which becomes spread between the two layers, is a very active developer which also contains a silver halide solvent such as *hypo*—sodium thio-sulphate. The negative image on the film base develops very rapidly by normal chemical development. Simultaneously, the areas of silver halide which have not been exposed (representing the shadows) are dissolved by the *hypo*. This latter action forms a complex silver compound which diffuses into the receiving layer. This layer contains another chemical—usually silver sulphide—which causes the dissolved

Only one type of film yields a reusable negative, which must be immersed in a sodium sulphite solution straight away, and then washed.

Colour materials

The peel apart colour films use a similar technique, with the usual additions needed for colour processes. The negative part contains the conventional tripack of emulsion layers sensitive to blue, green and red light respectively (see page 550). But each layer has, adjacent to it, an additional layer containing the appropriate image dye—yellow for the blue sensitive layer, magenta for green and cyan for red.

These dyes are not formed during development, as is usual with conventional colour processes, but are already complete. They form part of complex compounds

When a silver halide grain is exposed, it traps the dye-developer which develops it, and so the dye is 'anchored'. In areas which have not been exposed, the dye-developer is mobile and free to move up to the image receiving layer, where it is anchored to form the positive. Diffusion is slower than development so that, for instance, a mobile cyan dye-developer does not develop and so become trapped in the other layers as it travels through. These layers will have already been developed. To further slow down the diffusion, spacing layers are placed between the three colour layers.

If, for example, an area is exposed to red light, the dye-developer connected with the red sensitive layer (cyan) becomes trapped by the halide layer and cannot form part of the positive image.

Dye-developers from the other layers (yellow and magenta) are, however, free to move to the image receiving layer, where they combine to give red.

Dry pictures

The peel apart films need fairly accurate timing of the development process, and involve messy chemicals. More recent dry films avoid both these problems. The principles are similar, with a few additional complications.

With Polaroid types, the light travels through the image receiving (positive)

layer, which is transparent, to reach the negative material. With most other instant films, including the Kodak dry types, the light enters from the opposite side. Therefore, in order to get a correct reading image, a mirror is used in the optical system of Polaroid dry film cameras.

The integral reagent pod is burst by the motorized ejection through rollers after exposure. As usual, this spreads the reagent between positive and negative materials to initiate development and dye diffusion. It also contains titanium dioxide

which forms a white layer beneath the image to show the coloured dyes by reflected light.

Also in the reagent is a chemical which is initially opaque. In alkaline conditions, at the beginning of development, this chemical prevents light from reaching the negative layer. This means that development can take place in the light. As development proceeds, the conditions change, becoming more acidic, and the reagent clears. By the time full development is complete (within two or three minutes),

most of the active chemicals are neutralized, and the permanence of the image is good.

Kodak PR-10 film is similar though with a few differences which make the two systems incompatible. The Kodak material requires that the image-forming light enters from the rear of the unit, opposite to the receiving layer. For image formation, the reagent is a developer, as in the peel apart types, but one which reacts with unexposed areas. So this is a direct reversal dye-release version of the DTR process.

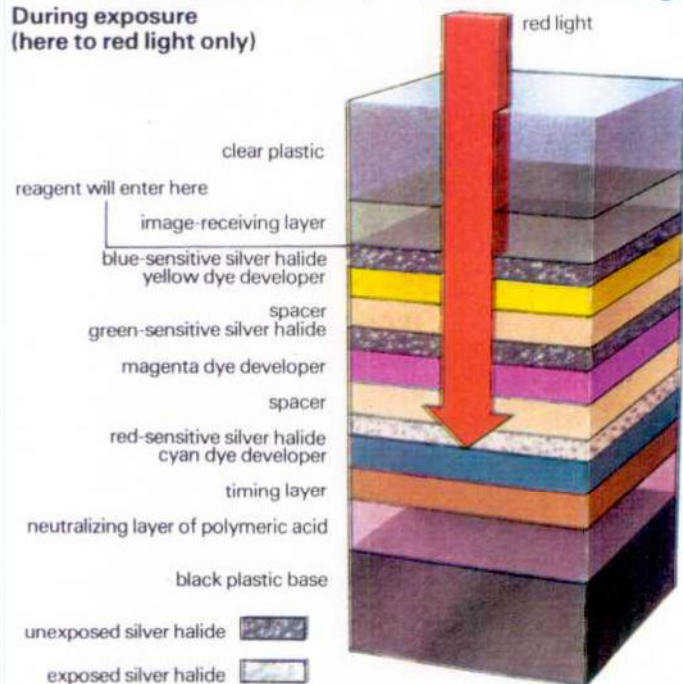
Instant pictures

The most popular sort of instant picture material is the dry film type. The image develops in daylight, and is protected from the light by a reagent layer, which is opaque. Coloured dyes move through the reagent to the layer above, and then combine to give the final image. If, for example, an area is exposed to red light, the final image is formed by the yellow and magenta dyes.

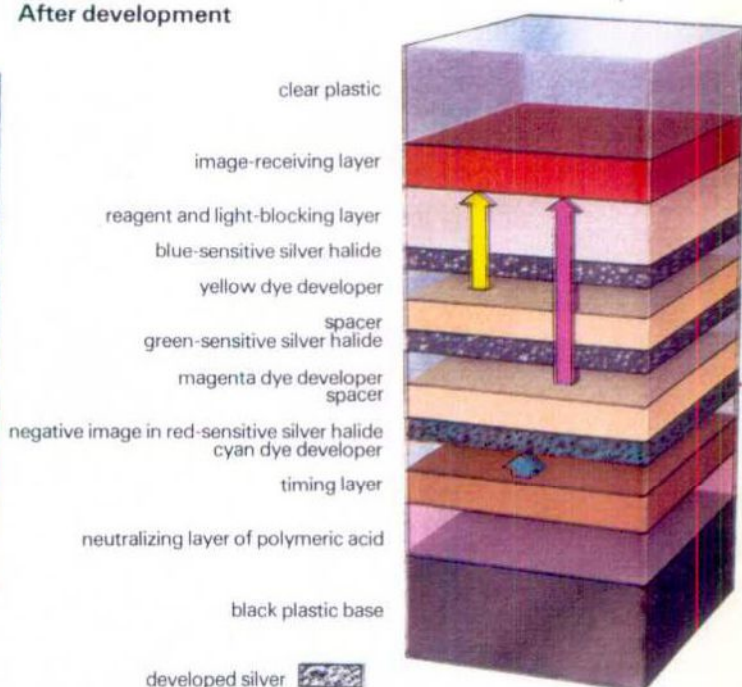


Cross-section of Polaroid dry film

During exposure
(here to red light only)



After development







World of photography

Reinhart Wolf

Architecture and food are not the most obvious subjects for creative photography. But one of Germany's top advertising photographers shows how skill in lighting and composition can make stunning shots

An acute sense of style and painstaking attention to detail are two major elements in Reinhart Wolf's approach to photography. These factors, together with a mastery of lighting, have made him one of Germany's top advertising photographers, and given him a well-established reputation throughout the world.

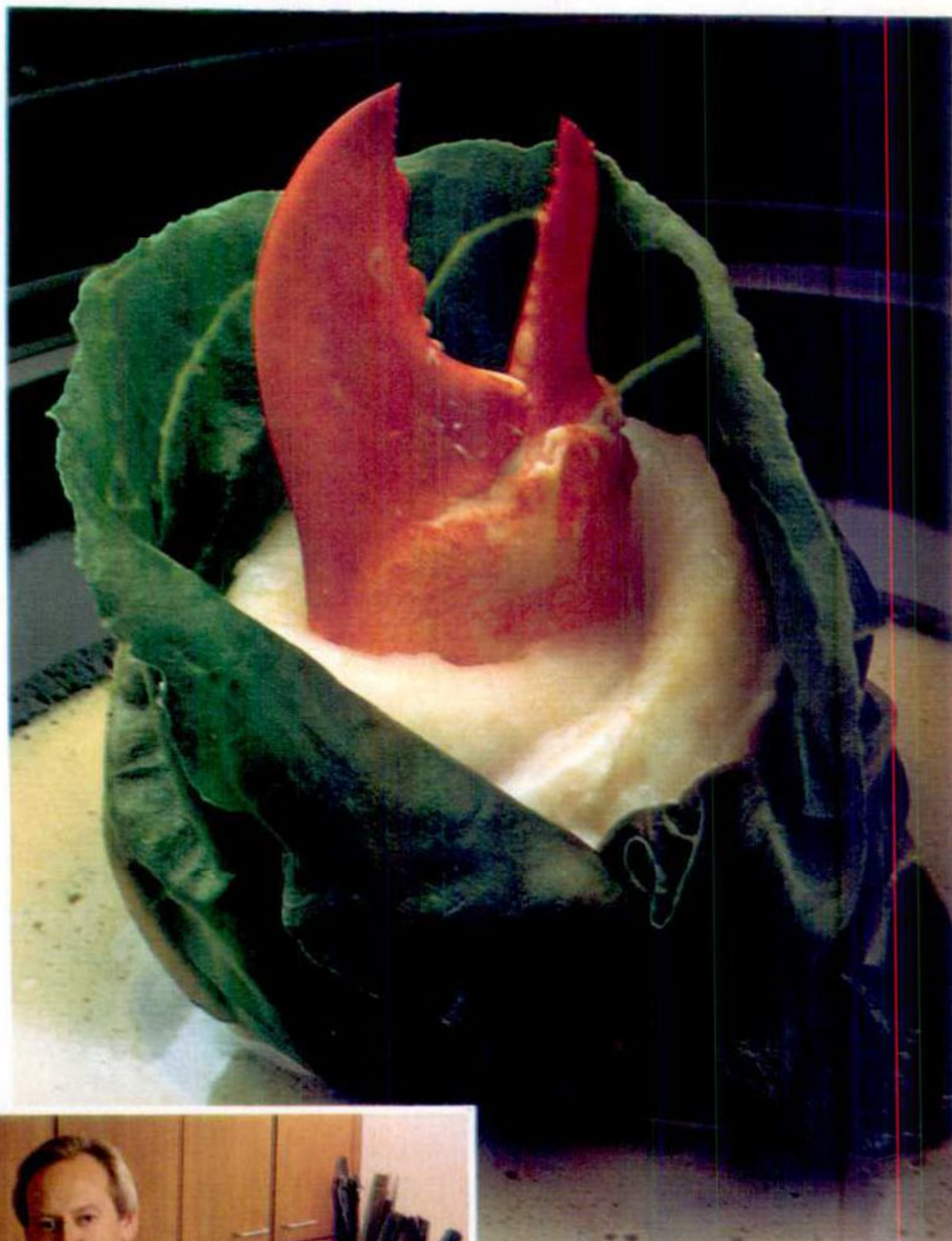
However, Wolf's reputation is not only based on the quality of his advertising work. He is also renowned for his superb editorial work for such magazines as *GEO* and *Stern*, and for the excellence of his architectural photography. His architectural photographs have appeared in many magazines and more recently in two books—*Faces of Buildings*, published in Germany in 1979 and the superb *New York*, on the skyscrapers of that city, published in 1981.

Reinhart Wolf's base is a spacious, elegant studio in a modern building which stands in the heart of the old city of Hamburg with its quaint cobbled streets and Gothic architecture. Here he takes the majority of his commercial photographs, and also runs the production company which he has set up to

The Waldorf Astoria (left) Taken for Wolf's book *'New York'* and showing the intricate details of the hotel's tower

Culinary delight (right) This seafood dish was photographed for a special item on gourmet restaurants for *'Stern'*

Reinhart Wolf The photographer in his kitchen demonstrating a favourite hobby—the art of cooking



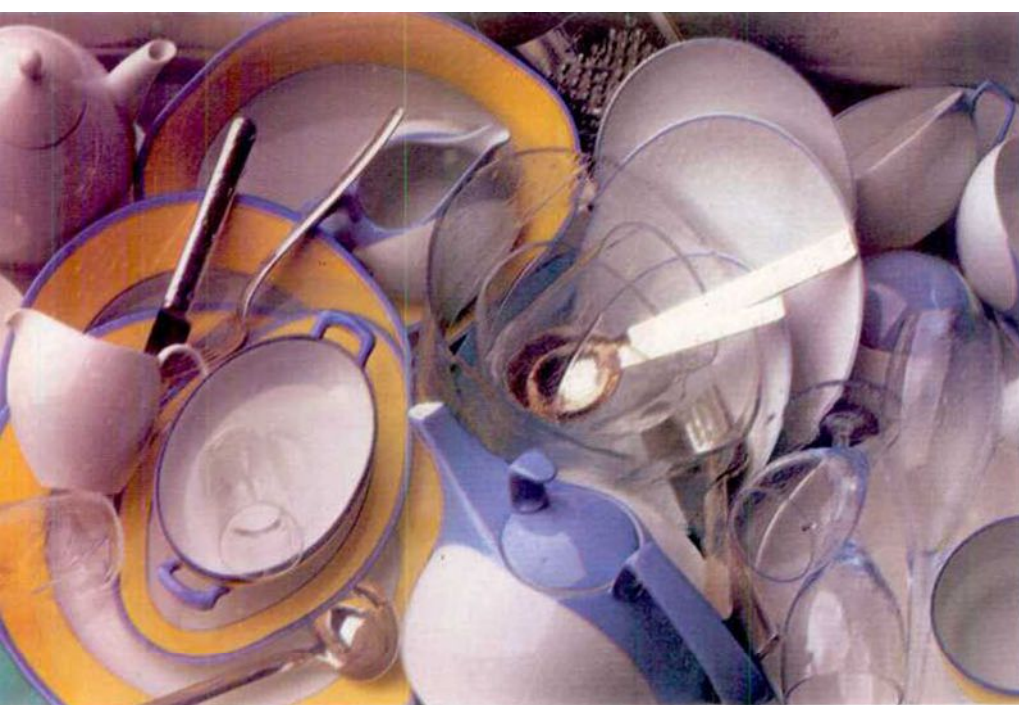
Reinhart Wolf



produce advertising films.

The studio is arranged on two floors. On one floor is the photographic studio itself, with its array of lights and carefully organized equipment, with an adjoining dressing room and kitchen. On the other is a luxurious sitting room carpeted with cowhides and furnished with custom-made seating made from aluminium camera cases. From this room Wolf's clients can look down on the studio below or from its balcony down on to a fine Japanese garden.

The pride and joy of this studio is Wolf's enormous soft light box—two metres square—which is perhaps his most important piece of studio equip-



Kitchenware This picture was used over two pages in German 'Vogue' to illustrate a variety of 'designer' tableware

Reinhard Wolf

ment. It was this item which gave him a major advantage over his contemporaries in the early 1960s. As Wolf says, 'At that time everyone was using direct flash which produced a horrible, harsh effect. I was one of the first European photographers to see these light boxes at work in America and when I returned to Germany I had one made. I'm using the same one now and it's still better than those manufactured nowadays.'

Wolf's mastery of lighting techniques contributed enormously to his early success as did his awareness of the changes occurring in photography, especially in America. Once he had mastered the techniques he was then free to develop his own individual and highly distinctive style. He reiterates the

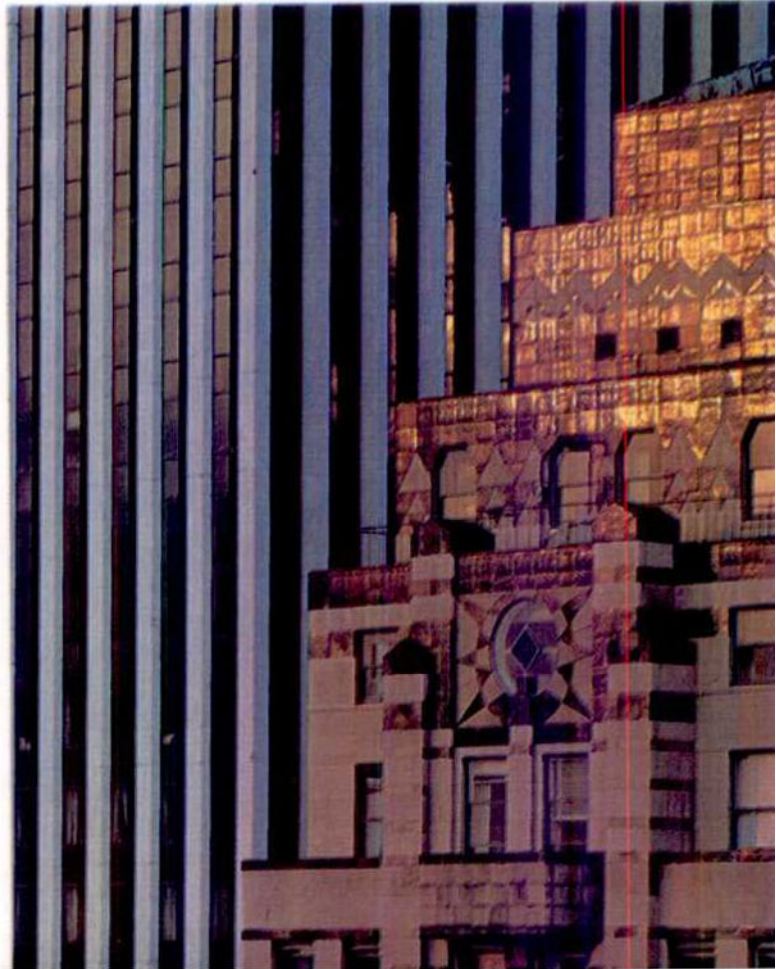
importance of these elements when he talks about the students that he still occasionally teaches at photography workshops throughout the world.

'I often have to teach them to get rid of their technique and "see" what is in front of them. I have a very good relationship with technique but I'm not technically minded. People often let technique interfere with their ability to see. Either that or they are so much into art that they think it doesn't matter how they do something. I think that in photography the idea still plays an important part. Both should be together. For example, the work of the young American photographer, Robert Mapplethorpe, displays the perfect combination of execution, art and ideas.'

Wolf also feels that young photographers should not just master the techniques of photography but also learn from a wider experience of the world. 'Being in advertising nowadays you have to work worldwide and you have to be cosmopolitan—in the best sense of the word. To travel, meet other people, speak different languages, and to know what's going on in the world of art and music. These are the most important things besides the obvious basic elements—the innate ability to compose a picture and to train the eye to see the world about you.'

An ability to learn from the world around him was an important aspect of Wolf's own early career. He first visited America in the late 1940s as one of the few recipients of the US scholarships available to young students in post-war Germany and studied history of art, literature and psychology in Indiana. In America he was introduced to the work of some of this century's most influential photographers such as Irving Penn and Edward Weston and to the wonders of the Museum of Modern Art in New York.

'When I first went to America it was quite an adventure for me. I hadn't seen anything like the work of these photographers before. All we had seen in Germany was the pre-war style of photography and the war photographs. On his return to Germany photography did not seem to offer a very profitable future and Wolf was still thinking of pursuing a career as a teacher or



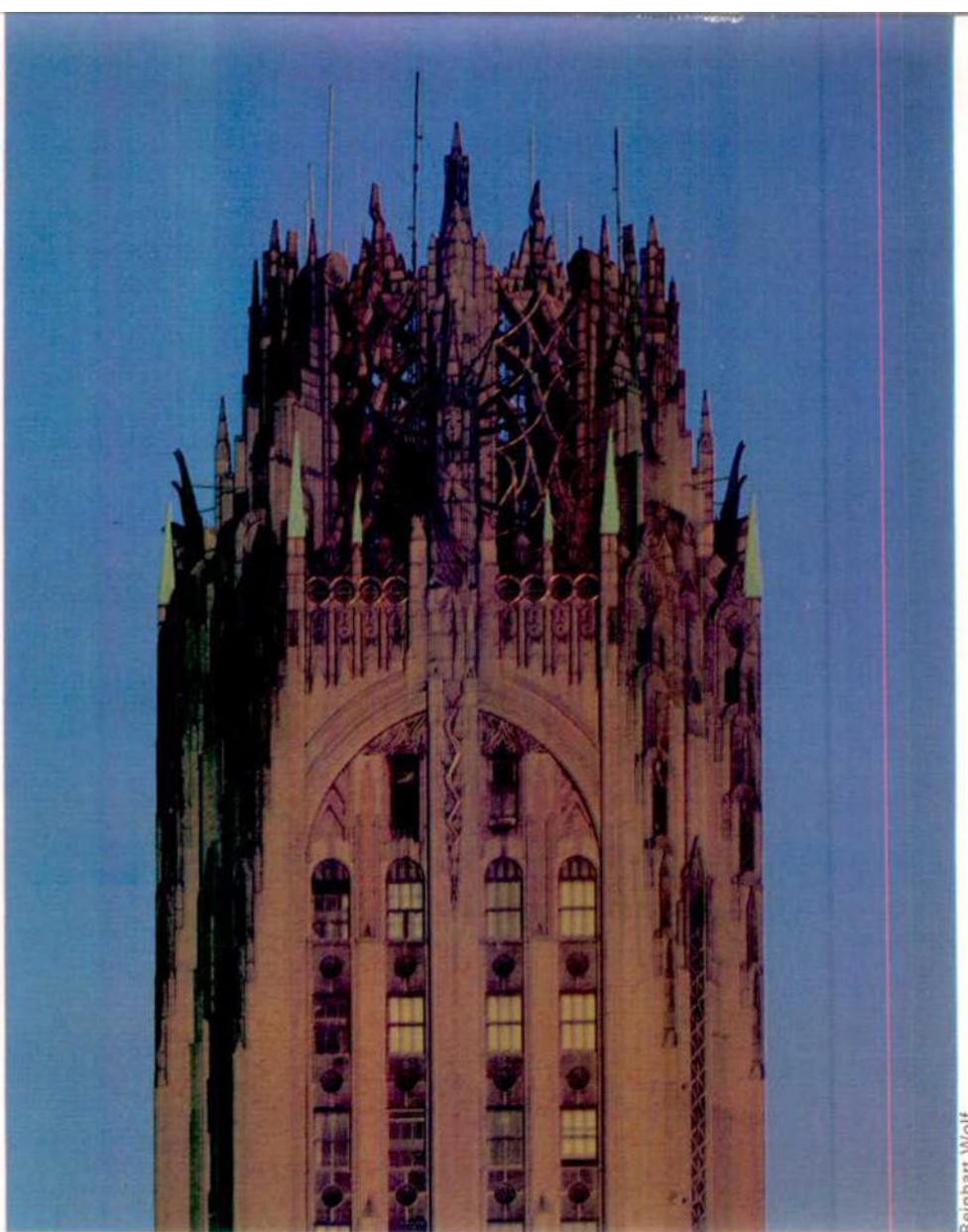
journalist, but photography had always been his first love. Both his father and his grandfather were enthusiastic amateur photographers and, at the age of 14, Wolf had traded a favourite toy train for his first camera.

His interest in photography continued through his school and student days. He founded a camera club at his school and used his first scholarship money to buy himself a kit containing three photographic lamps with which he took portraits of friends and teachers at college. Then, after continuing his studies for a few years in Germany, he headed for Paris which was then, as now, an important cultural centre and a magnet for artists and writers.

His early portraits of some of the artists who lived there are still some of his favourites. Impressed by his dedication, his parents persuaded Wolf to return to Germany to take a Master's degree in photography so that he is now one of the few established photographers working today with this notable academic distinction.

From that time Wolf determined to earn his living from photography. He obtained a part-time job teaching at the School of Fashion and Design in Hamburg and used the rest of his time to try and obtain photographic commissions. After only a few years he had obtained a sufficient number of clients to give up teaching altogether and concentrate on his photographic career.

Over the past two decades Wolf has worked for an extraordinary variety of clients undertaking both location and studio work. 'I've tried not to specialize in my advertising work because adver-



Reinhart Wolf

General Electric Building (above)
Shot in the last few moments before dawn on a 10x8 camera so that every detail of its ornate tower was picked out by the weird half-light

Fuller Building 1928-9 *This is one of the most beautiful buildings in New York. Here it is displayed to perfection in the first few rays of the rising sun*

Herr Kaysen
Taken for a GEO assignment on the city of Bremen. This 90 year old man exercises by chopping wood for two hours every morning

tising itself is so limited. I wanted to at least maintain the freedom to do as many things as possible within it.'

He also owns a company that makes short commercial films but he has never felt inclined to make more films himself. 'I enjoy making films but I prefer photography. You have more control over your medium. With films you have to depend on too many other people. There are too many elements that might go wrong.'

In recent years, Wolf has concentrated increasingly on editorial work and on his architectural photography. He has, for example, done a series of stories for *GEO*. One of the most notable of these was a photoessay entitled 'Art you can eat', about Japanese food, which won him two of the highest accolades in photography—gold medals from both the German and the American Art Director's Clubs in 1980 and 1981.

'I would like to do more editorial and book work now, not altogether because commercial photography has actually taught me all the things I know now. If I hadn't been such a highly experienced commercial photographer I wouldn't have been able to do this kind of work. It needs so much patience and so much technical experience. You have to know exactly what's happening.'



Some of Wolf's favourite shots are architectural photographs. His first book, *Faces of Buildings*, was a collection of this work, and one of his finest achievements is his book *New York*—a gallery of some of the city's finest architecture. The photographs for this book were taken during visits to the city in 1979 and 1980, and were taken on the large-format (10 × 8 inch) Sinar camera, often using a lens a metre long. His entire range of lenses were 360, 480, 600 and 1000 mm and the pictures were taken on Kodak Varicolor negative film and Ektachrome transparency film. The extraordinary pictures that resulted are accompanied by architectural notes on each building and an interview with Wolf by the artist Andy Warhol, in which Wolf explains his personal philosophy and describes the circumstances of the book's realization.

The book is a hymn to New York's skyscrapers and shows the buildings at their best. As Wolf says, 'I think those buildings are so crazy. They express so much of the art and spirit of America and of what took place there in the 1920s and 1930s. The people who made these buildings wanted the highest, the best and the most sophisticated. They employed hundreds of craftsmen which is impossible nowadays!'

Wolf's pictures show the work of these craftsmen from vantage points that are unavailable to most people. 'The Greeks



The RCA Building, 1933 Flanked by skyscrapers built nearly 40 years later, the RCA still outstrips them all

Alberto Giacometti One of a series of portraits of artists that Wolf took in the early 1950s in Paris


Art you can eat Taken for a series of articles in 'GEO' on the more elaborate forms of Japanese food

put these kind of details high up on their temples where they could only be seen by the gods looking down on the earth from the sky. I think that possibly the Americans put them there because the architects showed models of the buildings to their clients. Seeing these buildings from above the client may have said, 'Well, these are very nice but they're so plain up here. Couldn't we do something about it?' If they'd look at them in the way they should have—from below—maybe they wouldn't have bothered.'

As with his studio work, Reinhart Wolf's pictures of buildings show how important lighting is to his work. Many of the buildings were photographed in the very early morning or in the last rays of the setting sun. 'Each of the buildings has its own light. Some of them were taken at midday. You have to watch each building and make up your mind which is the best light for each one. Sometimes I went back to a building five or six times trying to find the right light and the right point of view.'



Reinhart Wolf



In the pursuit of perfection, Wolf went to extraordinary lengths. Once he had decided on the buildings he wanted to photograph, he still had to obtain access to the places where he was going to set up his camera and often encountered problems which were only overcome after a great deal of patient persistence. 'I'd start out with the janitor and then talk to the building manager and sometimes I'd have to go to the owner or apply with a long letter. It could take a week or two weeks and some patient and complicated organization.'

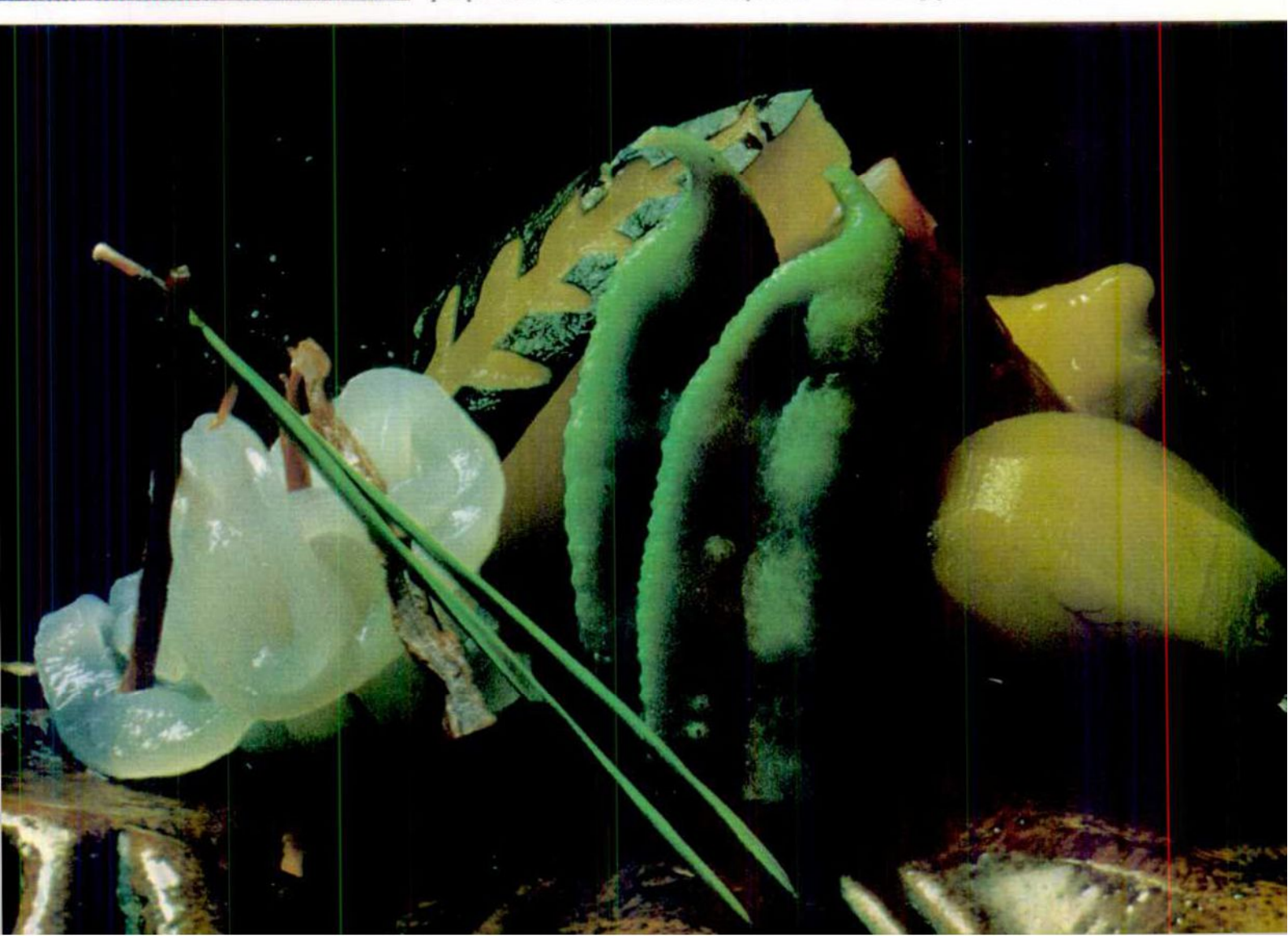
'Many of them were worried about insurance. It would worry me too, being up there with a strong wind blowing. If you put a lens on a ledge it might fall down and hit somebody on the head. You could very easily kill somebody. Once you start thinking about these things it's very frightening and I could understand the people who wouldn't let me go on their roofs.'

For Wolf the book has confirmed an initial feeling that he was creating something important and unusual. 'When I go to New York and show New Yorkers these pictures they often don't recognize the buildings. I showed one of the pictures to a typist who looks out of the window at these buildings every day and asked her if she recognized it and she didn't.' He finds this one of the most fascinating aspects of the work. Many people now tell him that once they have

seen the pictures, they start looking to see where he took them and how he did it. 'Then they start to get a new kind of relationship with the city they walk through. I feel that I have rediscovered the apparent—something that has always been there, but which people have stopped seeing. If you do that then it is a very exciting experience and it gave me a feeling of achievement and success'.

Reinhart is now thinking of giving the same treatment to other cities, probably American. 'Being European gives me a great advantage as I see these cities from the outside. Maybe if I tried to discover my own city I wouldn't discover so much.'

In this project, and with much of his commercial and editorial work, the secrets of his success lie in his patience, and in his romantic approach. 'I have a very romantic mind so I always try to make things better and more beautiful. My lighting is also romantic. Sometimes I get criticized for this. People say it's too perfect, too aesthetic. I know this is so, but that's the way I am. I'll try occasionally to change this and go against my natural approach. I'll introduce something imperfect into a still life for instance or split up the composition or add something disturbing. It can work very well but I always have to do it consciously. It's not in my nature to do it this way. My natural inclination is to do something perfect and beautiful.'



Dodging in colour

Few colour negatives or slides print 'straight' satisfactorily—many need correction to colour casts or shadow and highlight areas. For this, dodging techniques can be particularly useful

Many colour prints of high contrast subjects show detail in the light areas but little in the shadows, or alternatively have detailed dark areas but burned out highlights. Sometimes, also, colour prints show unwanted colour casts in certain areas. Such faults inevitably spoil a picture, or at least reduce a potentially good picture to a mediocre one. But there may be something you can do to improve such prints as these faults may not have been present in the negative or slide used to make the print.

If this is the case, the print can often be improved dramatically by 'dodging'—giving different exposures to different parts of the picture during printing, to control contrast and correct local colour casts. Dodging can also be used to create a variety of special effects.

With black and white prints, various grades of paper can be used to cope with an excessively high contrast negative and so dodging in black and white is the exception rather than the rule (see pages 222 to 225).

Colour printing paper, however, is normally available only in one contrast grade, since the processing procedure is standardized and it is not possible to control contrast by using 'hard' or 'soft' paper. Agfa do produce a 'softer' grade called MCS, but dodging remains the best technique for contrast control. In colour printing from negatives, there-

fore, dodging is frequently necessary and in printing from slides it is almost routine, since slides show an even greater density range than negatives.

Generally, to reduce the contrast range more exposure is given to the highlights of the picture—the dark areas of a negative, or, occasionally, the light parts of the negative are shaded. In this way, highlights are effectively darkened, and shadows lightened so that the range of contrast is not too great for the paper and so less detail is lost.

Dodging techniques

For colour negative printing, the techniques are virtually the same as those for black and white, relying simply on different exposures for shadows and highlights. To bring out highlight detail that would otherwise be lost, you must first make a test print in the normal manner to establish the basic exposure for the whole print (pages 164 to 167). You then make a test strip to find the correct exposure for the highlights to be dodged in—with practice you can dispense with this test strip and gauge the correct exposure for the highlights simply by looking at the original test print. When you have determined the exposure you require, prepare a mask with a piece of thin black card, making a hole slightly smaller than the area requiring extra exposure. This hole

should have a rough edge, so that the dodged area blends into the rest of the print.

Place a piece of paper on the enlarger baseboard, and make the basic exposure for the whole print. Switch the enlarger off, and make the additional exposure for the highlight area, holding the mask about 6 cm above the easel—for a typically small print—and moving it slightly throughout exposure to further soften the edge of the dodged area.

If, on the other hand, you want to lighten a shadow to bring out detail, these areas will require slightly less than the correct exposure for the whole print, and must be masked after a certain point in the main exposure. The exposure time for the shadow areas is again established with a test strip. To mask the shadows, you can make yourself a shading tool from a piece of black card (slightly smaller than the shadow you want to cover) fixed on a thin wire.

Dodging procedure

To make the dodged print, begin the full exposure as normal, but when the correct exposure time for the shadows is up, hold the shading tool above the selected area, keeping it moving all the time. When the exposure for the full print is completed, switch off the enlarger and process the print normally.

When a photograph shows a wide density range, decide whether you are going to hold back the shadows or give extra exposure to the highlights. Generally speaking, you should do whichever is easier. If, for example, you want to give a lighter tone to the edges of a portrait, you should cut a mask with an oval hole in the middle. Conversely, if the area you want to shade is just a small one near the centre of the picture, it is easier to use a shading tool. In some cases, you may have to shade more than one area, using both devices. Stopping down the enlarger lens lengthens the exposure required, and gives you more time to carry out the dodging technique.

When printing from slides, remember that shadows which need to be lightened

Local exposure control A straight print (left) from a difficult negative can often be improved (right) simply by holding back exposure in parts of the image. Using a card mask with a cut-out the approximate shape of the shiny table and window area, it is possible to give an overall exposure suitable for this area but to hold back exposure elsewhere part way through



must be given more exposure than the rest of the picture. Highlights can be shaded to stop them burning out.

With experience, it is possible to determine the amount of dodging you will have to do by projecting the transparency on to the enlarger baseboard. As the projected image is exactly the same as that of the final print, the deep shadows and extreme highlights are clearly visible.

For colour work, there is the added possibility of improving prints of dodging with colour correction filters. Sometimes, only a part of a picture has a colour cast, such as a blue shadow and dodging with filters can correct this. But this technique can also be used to give unusual effects, such as a reddish or greenish sky.

As usual in colour printing from negatives, to correct a cast of a given colour, you add filtration of that colour. If, for example the blue sky in a picture is too yellow and pale, it can be printed in by using a yellow filter for an addition-

Changing mood *A straight print of this impressive sunset showed a foreground which was light enough to distract the eye. By darkening this and lightening the sky a pleasant improvement has been made*

Georgina Shuckburgh



Michael Newton

al exposure of the sky only. If the yellow filtration were given to the whole picture, it would give an overall blue cast to the print. So the rest of the landscape must be masked during additional exposure.

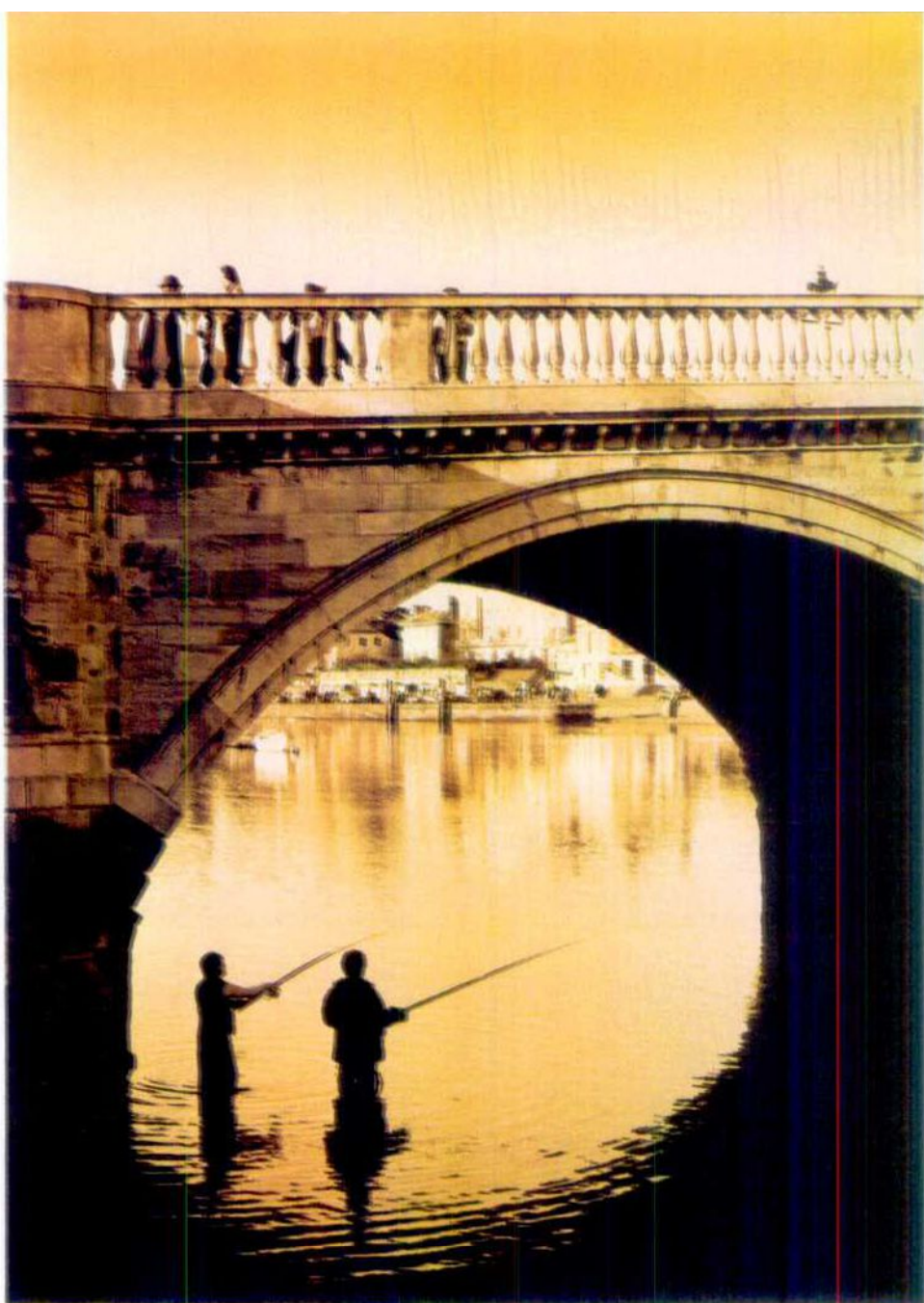
Dodging small areas

You may wish to alter the filtration of only a comparatively small area of the print. For example, a face may appear too red, but can be corrected by using a red filter on the end of a thin wire as a dodger for part of the exposure. A CC or CP 40R filter is suitable. A weaker filter may not have enough effect but if the filter used is too strong it can be applied for a smaller part of the printing exposure. A bluish shadow can be made more neutral in colour by shading it with a blue filter during part of the exposure. Again a 30 to 50 CC filter should be used.

The CC filter is preferable to ordinary colour printing filters as it is of higher optical quality and more suitable for use in image-forming light beams. A highlight, such as a sky, may pick up unwanted colour during printing unless the extra exposure is given through an appropriate CC filter, whose value can be determined only by test. Hold the filter in front of the enlarger lens while the necessary printing is carried out

Local colour *This print was made from a black and white negative. The main exposure had colour filtering to give a suitable tone to the stonework. All filtering was then removed to produce an orange cast when the sky and water highlights were burnt in*

Local colour correction *A straight print (below) leaves an unsatisfactory cast in the shadow whites of the hotel. By using shaped pale green filters on a printing jig, the walls have been lightened and colour corrected (right)*



Ethel Hurwicz



using a card with either a hole in it, or with its edge cut to a suitable profile.

It is helpful to fit the front of the enlarger lens with a clip-on holder in to which any additional CC filters can be placed while printing is being done. Alternatively, when printing up with a card with a hole in it, the necessary filter can be placed over the hole to keep the printed up area neutral.

You have to take special care with your dodging technique to prevent clearly defined changes of tone appearing in the print. If it is difficult to prevent telltale signs of dodging, typically on subjects with distinct, straight-edged areas of tone, you may find it best to use a jig such as that shown on page 362. Such a jig was used to correct the fiddly shadow cast of the hotel picture on these pages.

The slightly bluish tinge of the glass itself acts as a filter and may mean you have to alter your standard filtration slightly to accommodate this. Dodging filters can be cut to precise shape and sandwiched between two sheets of glass. If only part of the overall exposure is

made through the dodging filters, be sure to replace the glass before continuing with the exposure, otherwise refraction effects will cause a double image towards the edges of the print.

For small, less clearly defined areas, filters attached to piano wire and cut to shape like a normal dodging tool are perfectly adequate.

These suggestions, however, apply to negative-positive colour printing. In reversal printing from slides, however, not only is it necessary to reduce exposure to darken an area and increase exposure to lighten a tone, but the filters required to eliminate unwanted casts are complementary to those needed when printing negatives. Filters of complementary colour to the cast you want to remove should be added to the exposing light beam. Thus, a blue sky which is too yellow and too light in tone in a trial print must be shaded with a blue filter instead of being given increased exposure through a yellow filter as would be necessary in printing a colour negative.

When you have learned how to carry out these basic techniques, you can use them to create some imaginative pictures. You can, for instance, apply a filter over the sky area of a photograph,

to give it a completely unexpected colour, such as green, yellow or red. Used in the right way, this technique can produce dramatic or surrealistic effects. For example, a shot taken with the sun just setting could be printed using filtration to give the sky a purplish colour, while the exposure could be reduced for the rest of the frame, giving a moonlight effect. Another technique is to make a hole in a filter and to dodge a portrait or a picture of a flower to give it a pale pastel shaded surround, while the middle remains the normal colour.

Colouring black and white

Taking the process a stage further, these techniques can be used to make coloured prints on colour printing paper from black and white negatives. This is an extension of the procedure for making prints with an overall tint from black and white negatives (see pages 858 to 861). If you regularly use only colour reversal paper, you must first make a positive black and white transparency from the negative, but the same general procedure applies.

This method can be used to add colour to a landscape, or to create a startling area of colour in an otherwise monochrome print. Some originals are easier

than others to colour. Ideally, the areas to be coloured should have smooth, straight edges, so that you do not need to make complicated masks. The perfect example might be a beach scene, for example, where the areas to be dodged consist of straight-edged areas.

The first step is to establish the correct exposure time and filtration for a neutral grey print, as described on page 859. If you have printed other negatives in this way, you may be able to dispense with this step.

The next stage involves deciding which areas are to be printed in which colours. Calculate the exposure required for each part of the print taking the filter factors into account.

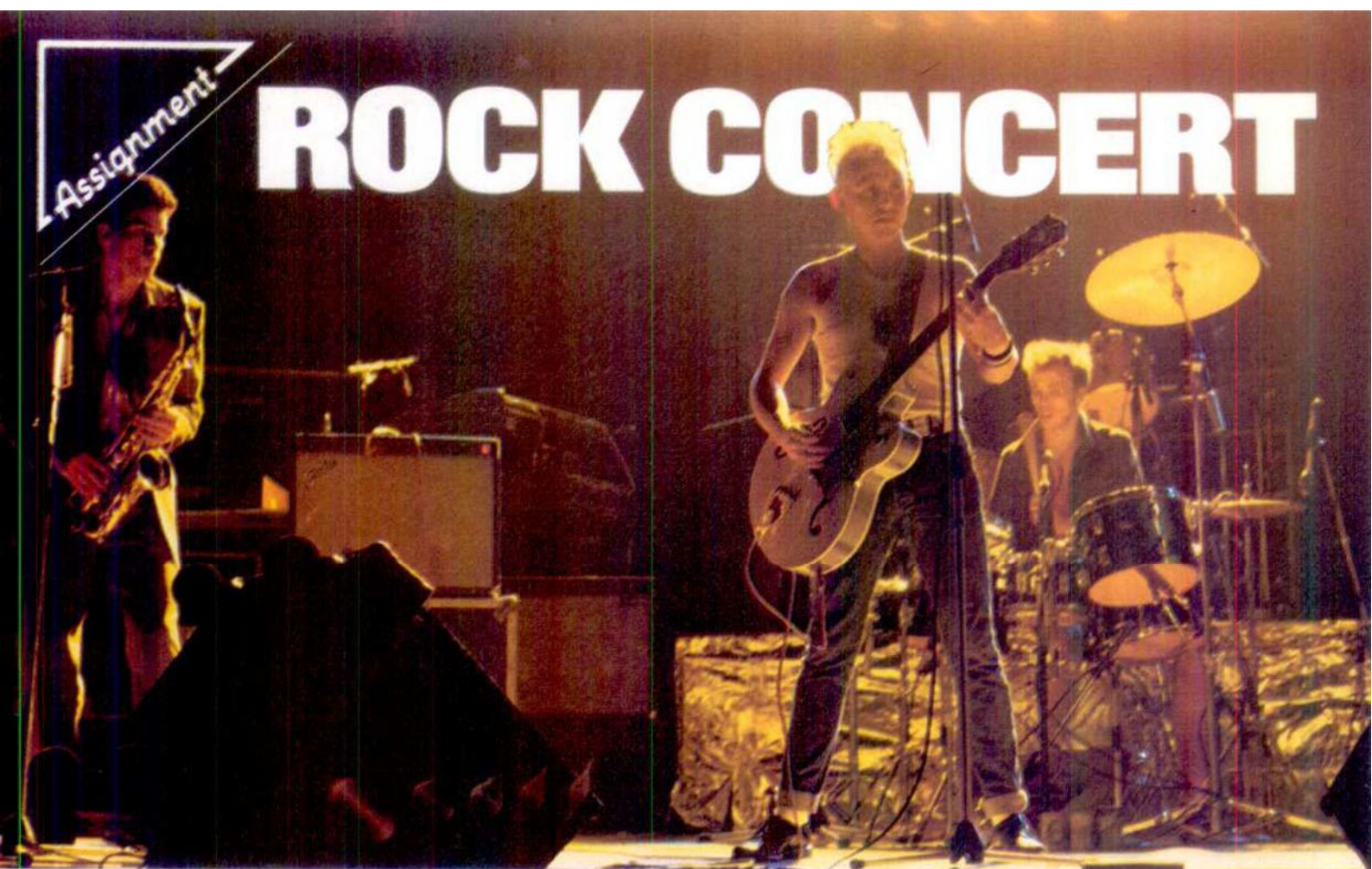
If you plan to merge one colour into another, your dodging technique should be very accurate. It is possible for two colours to overlap to produce an unexpected result. So when making the actual exposure, you may find it necessary to hold a sheet of thick card over the paper easel to show you where each area of the image falls. You can then put your filter or mask in place prior to removing the card and making the exposure. Alternatively, you can use a jig or a special mask produced from exposures made on lith film.



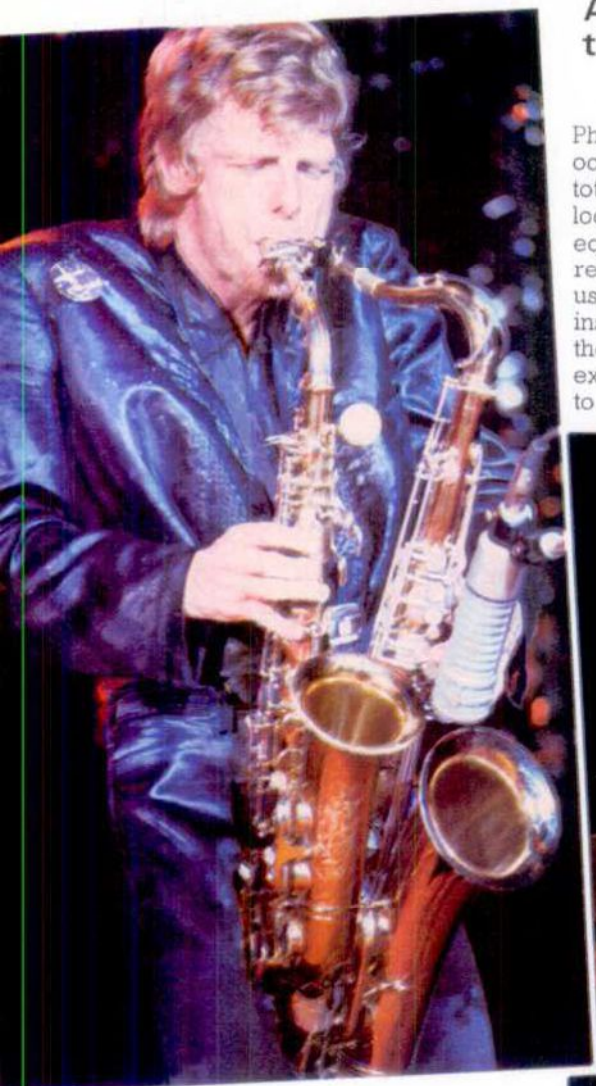
John Ward/Photocolor II print materials courtesy Photo Technology Ltd.

Assignment

ROCK CONCERT



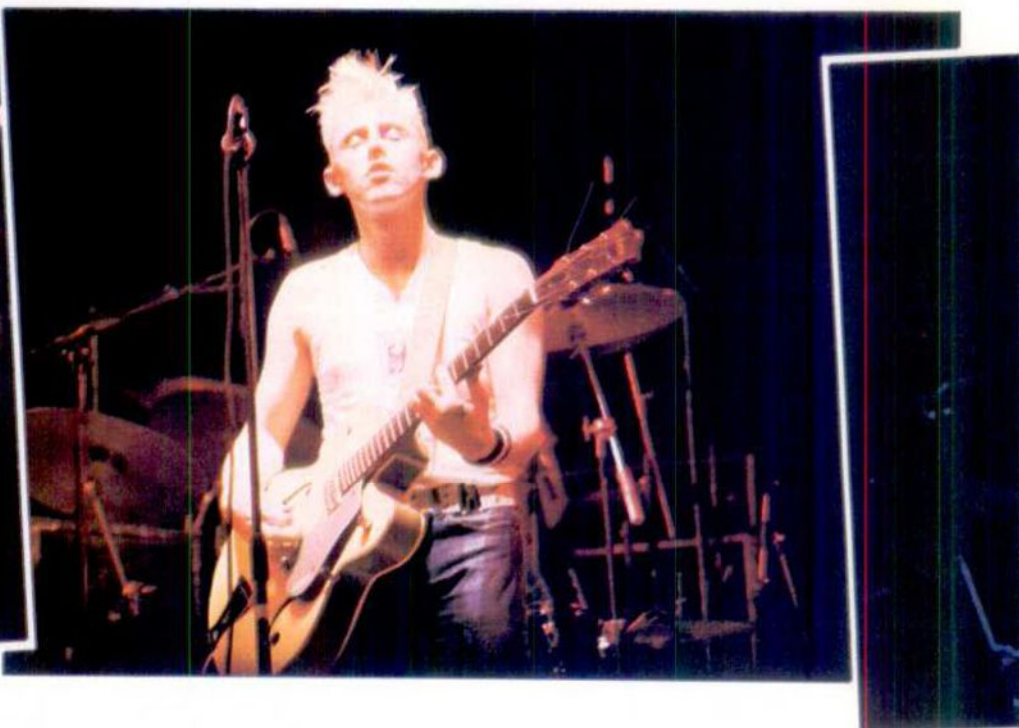
Anyone keen on rock music wants to take pictures of their favourite stars. But what is the best way to take pictures in the often chaotic conditions at a gig?



Photographing a rock concert is an occasion when the photographer is not totally in control of the subject or the location. No matter how good the equipment or technique may be, the results are at the mercy of the lighting used for the performance and of the inscrutable will of the crowd attending the concert—if a hall full of thousands of excited music lovers will not allow you to get close to the subject, or to get just

the angle you want, there is little that can be done.

At many rock concerts photography is forbidden, often because the performers do not want pictures appearing over which they have no control. But we asked rock photographer Laurie Lewis to shoot an assignment at a venue where photography was permitted. He had no special facilities, so he had exactly the same opportunities as any other member



Theatre of Hate Laurie used his *f/1.4* standard lens for the backlit shot of the supporting group, **Ian Dury** A 200 mm shot at *1/60* second, with the lens at its full aperture of *f/4*

of the audience.

Laurie found that he was unable to photograph the concert from a position of his own choosing. Instead he ended up in an area of the hall where he was surrounded by security guards, keen amateur photographers and a mass of fans.

To get a more effective result from the tungsten lighting, Laurie Lewis always uses tungsten film for this sort of work and to get some extra speed he generally uprates it by two stops. He uses 28, 50, 105 and 200 mm lenses but nearly always sets the aperture wide open, varying the shutter speed from *1/8* to *1/200* second, depending on the movement of the subject. In rock and roll, the lighting has its own often vivid colour, so there is no point in trying to record accurate skin tones. Flash is disliked by the performers and gives very flat results, so few photographers use it. But full theatre lighting can actually be quite bright, so the highlights are often burnt out.

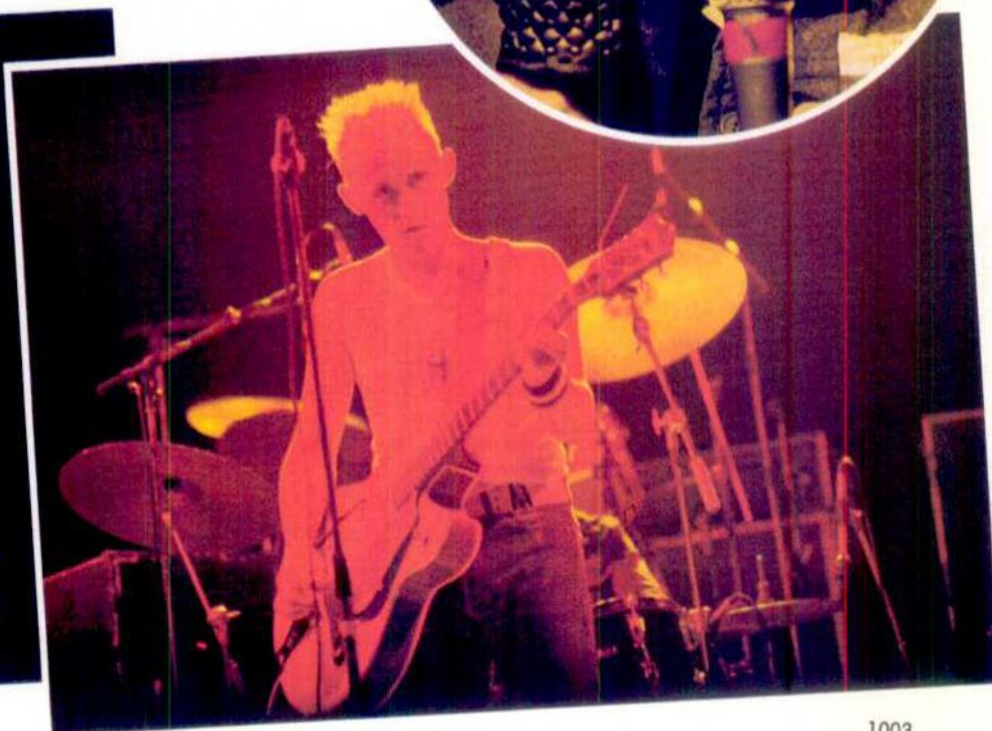
Always prefocusing and trying to photograph subjects on the same plane to cope with the restricted depth of field, Laurie found himself totally at the mercy of the light. A pulsating spot light illuminated the main performer, Ian Dury, and Laurie had to time his exposures to either use or avoid this light, depending on the settings he had made and the effect he wanted.

Laurie used the TTL metering in his camera to determine the exposure for these shots but he has a specially designed illuminator fitted to his viewfinder so that he can more easily see the movement of the meter needle in the dark conditions which often prevail at rock concerts.



Sax player (far left) By filling the frame with the 200 mm, Laurie's TTL meter gave a 'spot' reading which formed the basis for other exposures. **Changing colours** These three shots show how the lighting can change in seconds. All were taken with the 105 mm lens, *f/2.5*, at *1/60* sec.

Close-up Laurie used the 200 mm lens at *1/60* for this moody view. By propping the camera against a pillar, he could use *1/8* sec



Improve your technique

Photographing birds

To take good pictures of birds, you need to combine two skills—those of a photographer, who is able to adapt to varied and challenging conditions, and those of a hunter, able to lie in wait, or silently pursue the quarry

Birds are the only form of wildlife that most of us notice regularly—even for a city dweller, hardly a day goes by without seeing a bird or hearing its song. It is hardly surprising, then, that so many people choose birds as subjects for their first attempt at wildlife photography. Getting a picture is often only a matter of leaving food out in the garden and waiting for the subject to swoop down, but if you are prepared to look farther afield, it is easy to photograph many of the less common species in their natural, rural habitat.

The single most important factor affecting the quality of your pictures of birds has little to do with photography—it is your knowledge of the birds themselves and the techniques of getting close enough to them. If you know where you are most likely to find a particular species, your chances of coming back with a good picture are that much greater than if you are totally ignorant of birds' habits.

Learning about birds has another purpose. As cities grow, and woodland is uprooted for farmland, there are fewer available habitats for many species of birds. If you have learnt something about the creatures you want to photograph, you will soon learn how best to go about it without disturbing them or their young. Some birds are relatively tame, and will tolerate attention from a photographer, but other species must be approached with much more care to avoid disturbing them. In many parts of the world, birds of all species are protected, and you can be heavily fined for intimidating them. Even if this is not the case, the bird should come first, not the photograph.

Equipment and materials

The photographic equipment that you need to get effective pictures of birds varies according to the species that you are photographing, and how close you can get to it. For stalking birds, for

example, you ideally need a lens with a focal length of 200 mm or longer, but if you lay bait, and sit in a hide, even a 135 mm lens may prove more than long enough. In general, you should use the shortest possible focal length that allows the bird to occupy a reasonable portion of the frame. You can then minimize such problems as camera shake and shallow depth of field. There is no point in using a 400 mm lens if you can move in closer and use a 135. However, probably the most useful focal length for expeditions in the field is the 300 mm—this is neither too long to be unmanageable, nor too short to pull in images of more distant birds. Even a lens of this focal length, however, will be inadequate for anything but the largest birds unless you can move in quite close. You can use a $\times 2$ teleconverter, though, to double

Gulls in flight Not all birds are naturally timid—many will come quite close to the photographer





Blackbird A fall of snow makes birds that are normally well hidden stand out against a clean white background

Thinly disguised hide Camouflaging a hide is unnecessary—it is the shape of the human figure that scares birds



magnification of a long lens.

Zoom lenses can be very useful because they make it possible to photograph a whole group of birds together and then to close-frame one individual specimen quickly, without moving the camera or lens. Only the longer zooms are suitable, though, and a wide to tele zoom is not sufficiently powerful.

A camera support is vital, and some photographers never take a single picture without one. Use the sturdiest tripod you can comfortably carry, particularly if you are using a long telephoto lens. Four or five section lightweight tripods may be less of a burden on your shoulder when you are walking, but they cannot hold the camera steady, particularly in a fresh breeze. If a tripod is out of the question, then use a monopod, shoulder brace or car window clamp instead. The more rigidly supported the camera is, the better—more wildlife pictures are spoiled by camera shake than by any other fault.

Choice of film is dictated by conditions. As a general rule, use the slowest film that you can. Fashions in bird photography do not change, and the graininess that is apparent on fast films is never an asset. If the lighting is very bad, or you need to stop action, you may need to use a 400 ASA film, but if there is plenty of light, try to use a slow film such as Kodachrome 64. Not only does this give fine grain and better definition, but it also fades more slowly than other emulsions.

The exact choice of the film and equipment that is most appropriate for a particular photographic trip depends on

Improve your technique

how you approach the problem of getting pictures of a bird in its natural surroundings. Broadly speaking, there are three quite distinct ways of getting pictures: stalking the bird; wait and see—where the photographer lies in wait in a hide until the bird appears; and finally, nest photography.

Stalking birds

For stalking birds, you should use the longest lens possible because the farther you are from a bird, the less likely it is to see you and fly off. Always wear inconspicuous clothing, so that you blend in with the surrounding scenery. If you are going to be walking on the mud flats of a river estuary, then a grey outfit offers good cover, but inland, the brown and green of army camouflage battledress is less likely to be noticed.

Once you reach the general area where you plan to take pictures, first use binoculars to establish exactly

Gordon Langsbury/Bruce Coleman Ltd.



Car and beanbag Even a car can be used as a hide, with the camera rested on a beanbag over an open window

where the birds gather. Then approach as slowly as possible, moving forward when the bird is looking away or feeding. Birds only feed when they are relaxed, so this is the best moment to move forward, or to release the shutter. If the bird stops feeding and looks up, freeze immediately, as the slightest movement may cause it to take flight. As soon as it starts to feed once more, you can safely continue your advance.

Birds are much more sensitive to movement than they are to noise, and the sound that a camera makes is often drowned by the wind, or by the noise that a flock of birds themselves make. But even a slight movement is enough to scare a bird, and it is worth bearing this in mind when you spot a new arrival landing at the edge of your field of view. Resist the temptation to suddenly swing your head, or your camera lens, round to look at the bird. Wait until the other birds in the area settle down again, and then slowly turn your camera round to photograph the new bird. If you fail to do this, every bird in sight may fly off.

Wait and see

Putting out bait to attract a bird is the opposite approach to stalking it—instead of going to the bird, you wait for it to come to you. Although this may seem easier than stalking, it actually requires more organization on the part of the photographer. If birds are to land and take the bait, the photographer must not be conspicuous, and this generally means using some sort of hide and keeping out of sight.

A simple one person hide usually consists of a small upright frame, about

Sooty terns You do not need to fill the frame with a bird to make a good picture. Look out for atmospheric scene-setting shots like this



M. P. Kahl/Bruce Coleman Ltd

one metre square, and 1.5 to 2 metres high. It should be as light as possible, and easy to put up quickly. Guy lines will be necessary if the wind is very strong, and there should be no loose pieces of canvas to flap around and frighten the birds. A tiny window at the front of the hide provides space for the photographer to poke a lens out.

Perhaps surprisingly, birds are not frightened by a hide that does not blend in with its surroundings, so camouflage is not necessary. It is necessary, though, to conceal the hide from curious on-lookers, who might otherwise come and frighten off the birds. Try and place your hide in a position where it is not visible from nearby footpaths or roads.

Even a vehicle can be used as a hide, as birds seem quite oblivious to human figures inside. It is even possible to drive a car slowly forward without being too much of a distraction. As soon as the windows are wound down, though, the birds may become aware of being watched and will be much more sensitive to your movements.

Laying bait outside a hide is not just a matter of sprinkling seed and waiting for some action. Although this may attract some attention by chance, regular feeding at the same spot is needed to establish a routine and the birds' confidence. Once birds know that there is food to be had at a particular spot, they will keep on coming in increasing numbers, and you will be able to get the pictures that you want.

Bait can be bird seed, pieces of raw meat, or just household food waste, depending on the natural diet of the bird you are trying to attract. Do not just throw the bait on the ground though—hang it up from branches, or scatter it on the top of rocks. This approach may give your shots a better background. You may even be able to photograph the bird against the light of the sky if the bait is well above ground level. If you erect your hide near an area where there is already an abundant supply of food, you may need no bait at all. Suitable locations for hides are river estuaries, where waders constantly feed at low water, and sewage plants, where birds gather to feed on insects.

Even in your own garden, it is possible to attract a large variety of birds if you put food out regularly. Set up a feeding table near the house, where you have a good view from a window. Build a perch alongside the table, and change this regularly, using natural materials such as rocks, or twigs and old tree stumps. Before feeding, birds invariably alight near the food, and look around for predators. Your perch provides an ideal viewpoint for this purpose, and if you change it regularly, you can introduce variety to pictures that are all taken at the same place.

On the nest

The third, and most difficult, approach to photographing birds is to catch them at the nest. The earliest bird pictures were



Bernard Reboulet/Jacana

Home-made hide As long as the photographer is concealed, almost anything will do as a hide
Soaring puffin A cliff top can provide a useful vantage point from which to photograph all kinds of sea birds





Varin-Visage/Jacana

all taken in this way, because the necessary equipment was so cumbersome, and exposure so long, that a nesting bird was the only one that kept still long enough to be caught by the camera.

This is no longer the case, and ornithologists try to avoid photographing a bird at the nest unless it is strictly necessary for scientific reasons. Usually, it is possible to get a picture of a bird by baiting or stalking it, and neither of these two approaches are as much of a threat to the survival of a species. A brooding bird is very sensitive to interference, and will often desert the nest and eggs at the slightest disturbance.

If you are an experienced ornithologist, and you want to photograph nesting birds, then you should get in touch with your local ornithological society. They will give you a list of protected species, and give you advice on how best to get the pictures you want without causing distress to the bird or its young—precautions vary from species to species.

If you are inexperienced, it is probably better to stick to stalking birds or putting out bait—neither of these methods constitutes a great threat to the survival of the bird, and they both make it possible to take quite beautiful pictures, sometimes without leaving your garden.

Creeping close For stalking birds, you need a long lens and great patience. Here, the photographer has concealed his tripod and himself with a blanket

Blue heron Large species of bird are often easier to photograph, because you do not need to get close or use a long lens to fill the frame

Jeff Foott/Bruce Coleman Ltd.





Improve your technique

Fireworks

Fireworks are a traditional way of celebrating special occasions, but can be particularly difficult subjects to shoot well

Fireworks always make an attractive subject for the camera, whether they are the elaborate set pieces put on for large crowds, or the small domestic fireworks that you can set off in your back garden. Although it is sometimes possible to take interesting pictures by just pointing the camera and hoping for the best, you can get much better photographs by carefully planning your shots with a particular result in mind.

Firework pictures do not demand any special equipment. In some cases, even a simple camera may give acceptable results. The crucial factors are the brightness of the display and your distance from the fireworks. If you are close to the front at a public display, a fairly slow standard or even wide angle lens, as used on compact cameras, is adequate. On the other hand, at small private firework displays you may need to use as fast a lens as possible, in which case the $f/1.7$ or $f/1.4$ standard lens of a modern SLR is needed.

The other main requirement is to be able to fill the frame with the fireworks. This is hard to estimate before you see them in action, but it is probably better to err on the long focal length side. A bursting star shell explodes in a fairly small area of sky, then fades away. Our visual impression is that the shell filled the sky but in reality the comparatively compact explosion itself is by far the brightest and most spectacular part. So an 80-200 zoom may be the most suitable lens to use, despite its lower speed than a standard lens.

A tripod is very useful if you want to include buildings, or people watching the display, in the picture, but it is generally feasible to hand-hold the camera. If you do not have a tripod, you may be able to steady the camera on a wall or a fence, and fire the shutter using a cable release.

You can use virtually any film, but the result will vary with the type of firework and the sort of exposure you make. A slow film gives brilliant, saturated colours and dramatic contrasts. A fast film allows you to take general scenes, with the crowd and surroundings illuminated by the glare of the fireworks, and to use short exposures so that moving fireworks are frozen. But the most spectacular effects are often time exposures of starbursts, which could be overexposed on a fast film.

Both negative and transparency films may be used, but transparency film can be more economical. Even an experienced photographer can end up with only a few printable shots on a roll of



H. A. Roberts/Tony Stone Associates

film, because there is a large element of chance involved in firework photography. With transparencies, you can instantly see which are the best pictures, and print only these successful ones, but it is much more difficult to pick out the winners on colour negatives.

Despite the fact that the colour temperature of fireworks is very low, you do not need to use artificial light

Fountain of colour Multiple exposures and coloured filters were combined to produce this effective picture

film—the coloured flares look quite natural on daylight balanced film, and tungsten balanced emulsions may even give pictures which look too cool and blue—we expect fireworks to appear in their natural, warm colours.

One important feature of fireworks is that the central areas are brilliant, but there are fainter surrounding sparks. This means that virtually any exposure will record something, but that at either extreme the results may be disappointing. If the exposure is too little for the film, you will see only a few coloured specks. If the exposure is too great, the result will be a washed out glare.

To add to these difficulties, the general brightness of fireworks does vary. Public displays tend to be very bright, with each starburst illuminating the sky and casting strong shadows. Home fireworks, on the other hand, are often much paler, and cover a smaller area.

Public displays

Fireworks at public displays take the form of either framed displays or air bursts. Framed displays are in some respects the easier to photograph, because they are generally quite static, and there is no problem in composing the picture. Air bursts, on the other hand, are often more spectacular, and well worth the extra care needed to capture them on film.

If you are photographing a framed ground display piece, you can take one of two approaches. One method is to use a small aperture and a long exposure to produce a softly lit time exposure, while the other involves a fairly short shutter

speed to capture the shape of the flares more sharply. These two approaches capture different aspects of the same subject, and neither one is necessarily better than the other. The choice of the most appropriate method will depend on the particular display you are photographing, and on other factors, such as the degree of ambient lighting and whether or not you are using a tripod.

If you do not want to be restricted by a tripod, you can hand-hold the camera for an exposure of 1/30 sec or shorter. In this case, you must use the lens at full aperture. But the fuzzy outline of fireworks obviates any lens faults that this may introduce, and depth of field is usually no problem, so there is generally no disadvantage in doing this.

Try to arrive at the location before it gets either completely dark or crowded with people, so that you can find a good position which allows you to fill the frame with the structure that supports the display. As each piece is detonated, try and take an exposure meter reading, and set your camera according to the built-in meter.

If the display does not fill the frame, your camera is likely to overexpose the bright areas to compensate for the darkness around. So the wisest course is to bracket your exposures by one stop both under and over, and by more if you can. Taking six frames at different exposures is not excessive.

Air burst In the course of a long exposure, the falling sparks leave brightly coloured trails in the sky



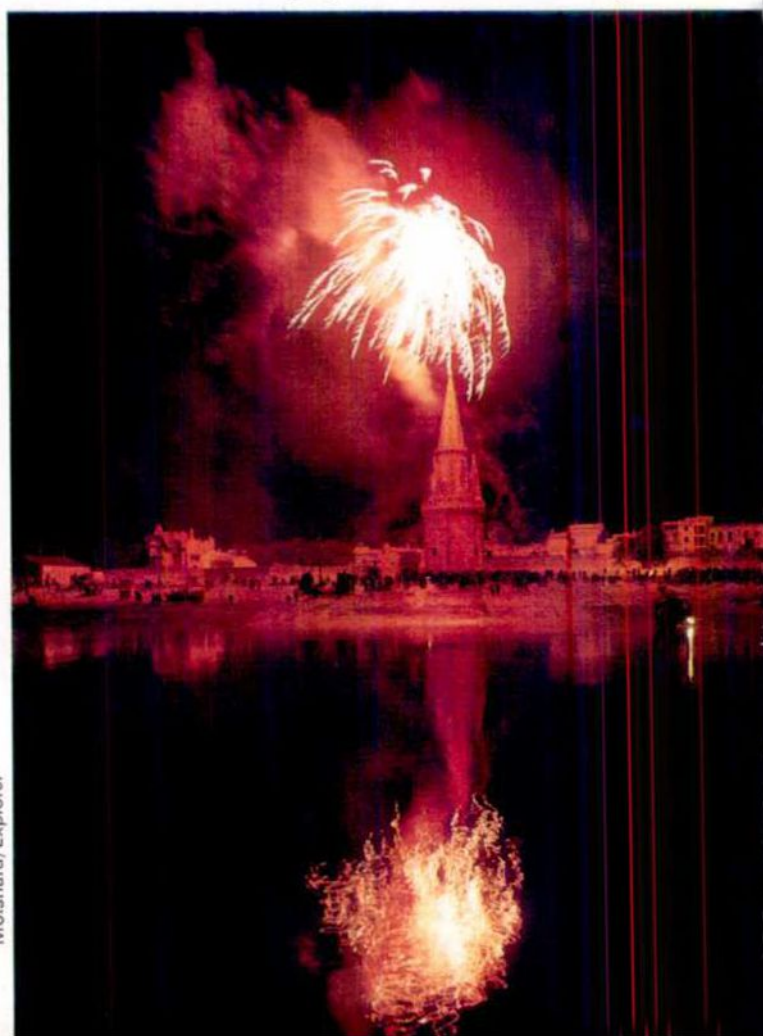
Jean-Pierre Gerard/fotogram



George Wright

Whirling sparkler For this kind of picture, you really need to use a tripod, or the rings of light will not be exactly overlaid. Bend the sparkler about six cm up the handle to make it easier to spin in perfect circles, and use a flash on the camera to fill in detail

Fireworks reflected Seaside displays can be particularly attractive, because the bright lights of the exploding fireworks can be reflected in broad expanses of water



Moisnard/Explorer

If the fireworks are distant or dim, the TTL meter on your camera may not be able to cope with the low light level. In this case, you must resort to guesswork. With a film of, say, 100 ASA, start with an exposure of 1/60 sec at $f/2.8$, and then bracket your pictures as widely as you can. A sensible series of settings would be 1/60 sec at $f/1.4$, $f/2$, $f/2.8$, $f/4$ and $f/5.6$ for an 'average' display.

If you have a shutter priority automatic camera, set the shutter to 1/60 sec, then move the exposure compensation dial in order to bracket the exposures. Start at +2 (some cameras show this as $\times 4$) then move to +1 (or $\times 2$), zero, -1 (or $\times \frac{1}{2}$) and finally +2 (or $\times 4$).

Aperture priority automatics are more difficult to use for bracketing under dim conditions, and unless you can use the camera on a tripod, it is better to set it to manual, and control the exposure yourself, rather than leaving it to the camera.

If you are using a lens with a small maximum aperture, you may have to use a longer exposure to compensate for the reduced amount of light reaching the surface of the film.

A tripod widens the range of options open to you, because the longer exposures that are possible can be used to spread the light from the fireworks into a softer pattern. If you do this, you must beware of overexposure—a long exposure of several seconds, combined with a wide aperture, will almost certainly burn out the image of a static firework, and leave a shapeless blur of white or yellow. You can avoid this by using a small aperture in combination with a long time exposure.

As before, take a meter reading, and base your exposure on this. Many cameras, though, have meters that do not function at speeds slower than about

George Wright

Fiery figure To produce this spectacular portrait, a black-clad figure traced the outline with a sparkler, then moved out of shot before the flash was fired

1/8 sec, so you must take this into account when measuring the light level. Reciprocity failure also complicates matters (see page 466). If you wish to use a two second time exposure, for example, take the meter reading with the shutter set to 1/30 sec. You must close the lens down

by five stops to compensate for the change in speed from 1/30 sec to 2 secs, so if the meter indicates an aperture of $f/2.8$, you must set the lens to $f/22$. Reciprocity failure, however, demands that you open up the lens by one stop—this is a typical figure—so the final setting is 2 seconds at $f/16$.

Using a tripod has the advantage that you can use other techniques in combination with the time exposure. Try tilting or panning the camera or moving it up and down during the exposure to spread the image of the fireworks across the frame. With a zoom lens, you can zoom in or out during the exposure to produce a similar effect, and a combination of zooming and panning can produce a very attractive result.

If you want to include the spectators in the picture in addition to the fireworks, you could try using a neutral grey graduated filter over the lens, so that the crowd at the bottom of the frame receives extra exposure, and the fireworks themselves are not overexposed.

Air bursts

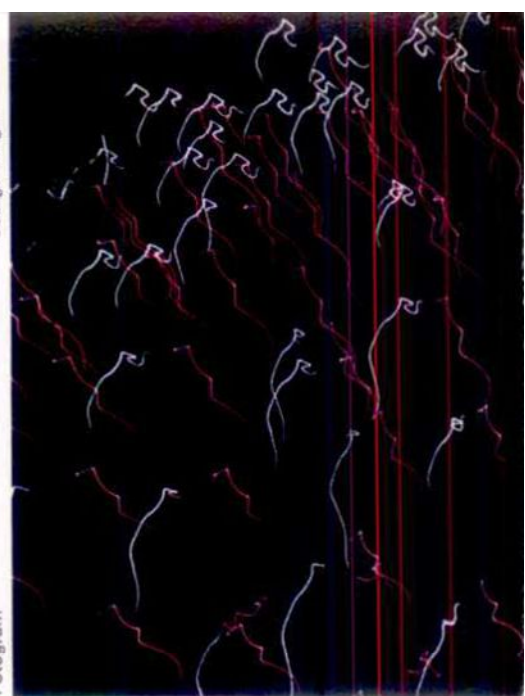
Rockets that explode in the air produce some of the most spectacular firework pictures, because their light is bright enough to illuminate the landscape around, and they can be seen from a considerable distance. However, they do not usually last as long as ground displays, so you must work more quickly to get your pictures. If you wish to include features of the landscape, it is





George Wright

Fotogram



essential to use a tripod, and in any case, this is a good idea when using an SLR, because the viewfinder blacks out during the exposure, and a tripod makes it easy to compose the picture carefully before releasing the shutter. Time exposures are often necessary, so a tripod is essential for the best results.

The flares of air bursts tend to occupy a smaller area than do those of ground displays, and relying on the camera's meter may result in greatly overexposed points of light. If you are using an automatic camera, therefore, set the film speed dial to a value one or two stops higher than that of the film in use. Use this as your standard exposure, and bracket your pictures.

Instantaneous photographs of aerial fireworks are often disappointing, and the most interesting effects are produced by time exposures. An exposure time of a few seconds is often best, allowing time for the entire burst. But a time as short as 1/8 second is sufficient to record an attractive cascade effect. It is often a good idea to record several fireworks on one frame, to increase the effect. This is possible either by using a camera with a multiple exposure facility, or by using one continuous time exposure and covering the lens with a card or lens cap in between the fireworks. Using this technique, any background lights may build up to an unacceptable degree, however.

With such a technique, the camera should be used on its manual setting. A typical aperture, using 100 ASA film, is f/8, but again, you should bracket.

With a hand-held camera, you can create unusual and unpredictable effects during the time exposures by moving the camera around as the flares fall through the sky. The results are often colourful, though they look quite unlike the original fireworks. Again, try combining several images on one frame.

Home displays

All over the world, special events are celebrated by letting off fireworks in streets and gardens, and though a small

Golden cascade Small domestic displays can be quite effective if you include some of the spectators in the picture

private display does not have the glamour of a large public one, it is somehow more exciting if you can light the blue touchpaper yourself.

For a photographer, small displays present slightly different problems to the larger ones. It is easier to include people in the pictures because there are not the problems of scale and distance that are encountered at the bigger events. On the other hand, small fireworks are less bright and do not look as spectacular, and a different approach is needed.

Hand-held fireworks make the best pictures, because they can be used to add interest to a portrait. The light levels are low, however, so unless you have a very fast lens and use film of at least 800 ASA, pictures of people's faces by the light of the fireworks are likely to be disappointing, though you may like to attempt them. A more successful approach is to combine a brief time exposure, to record the firework, with a flash exposure to show the people.

You can add variety to such pictures by asking the participants to wave the firework around in the course of a long exposure, before firing the flash off at the end. Even the humbler sparkler can make a good picture, and you can use one to write words in the air. Do not forget that unless the negative is flopped over at the printing stage, the words will appear in reverse. If you try this technique, stick to short words, as the longer ones tend to become incomprehensible by the time you get to the end.

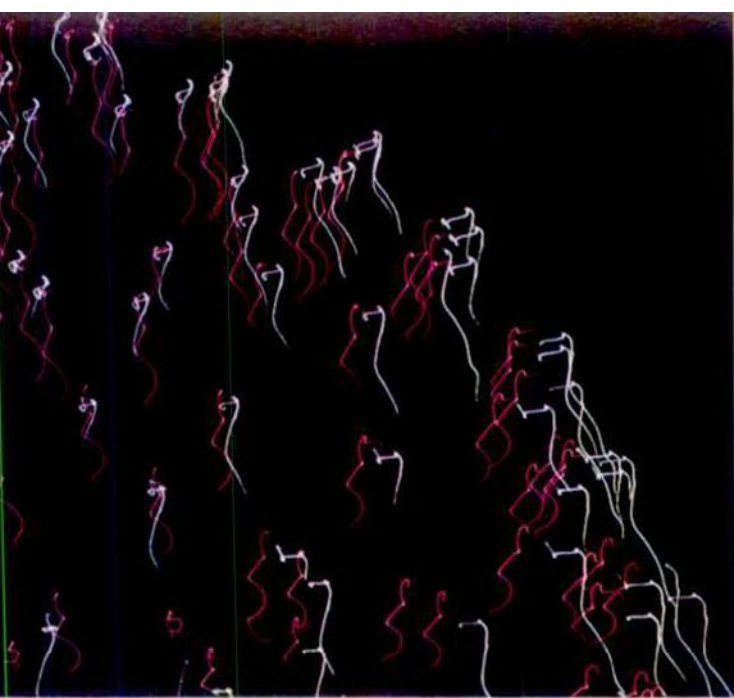
Sparklers can also be used to draw an outline around a figure. In the final picture, this will glow like a fiery overcoat, and should make a very unusual looking portrait. If the sparkler is moved quickly, the line will be thin and yellow, but moving it more slowly gives fatter, whiter lines. A flash at the end of the exposure adds life to the figure and supplements the light from the sparkler.



Michel/Explorer/Vision International

Whenever you use flash for firework pictures, take care to avoid over-exposure. Even a normal flash exposure can be too strong, and it is better that figures appear too dim than too bright. Set the gun to 1½ times the speed of the film you are using to give a fairly natural looking lighting balance. If this also means that you have to use a very small aperture, reduce its output by sticking black paper or tape over the flash reflector, and set it to manual to reduce its output. Unless you do this, the fireworks will appear very dim in the final picture, and will be overwhelmed by the flash. You will need to run a test film beforehand, to check flash coverage and to establish a new guide number.

Although hand-held fireworks provide the most scope for photography, other types can make effective pictures, too. Rockets and catherine wheels can be photographed in much the same way as their bigger brethren at public displays, but the less spectacular kinds that are placed on the ground or stuck in the earth can look disappointing if they are photographed carelessly. Use ground



Ball of fire By using a double exposure and a small flashgun, you can produce some surprising multiple image effects

Sally & Richard Greenhill



Showers of sparks Even with a simple auto-exposure camera, you can take pictures like these—elaborate equipment is not needed. If you have manual override, set the lens to a small aperture such as $f/8$, and use a time exposure of several seconds

based fireworks as backlighting for a row of figures—the brightly coloured flares of Roman candles can give an eerie, smoke shrouded picture.

Wherever you photograph fireworks, always observe the safety precautions that are printed on the lids of boxes of fireworks—lock pets indoors, do not get too close, and use a safety taper for lighting the fuse. Keep unused fireworks in a closed box, so that they are not set off by a stray spark.

Look after yourself when you are photographing. With a wide angle lens, you may be very close to a small firework, even though it looks deceptively distant in the viewfinder. If you use your common sense and do not get too enthusiastic, you should come away safely with some good pictures.

V. Pascal/Explorer





Rangefinder cameras

The rangefinder is one of the simplest and most successful cameras ever designed. Versatile and capable of first class results, it is worth considering as an alternative to the SLR

The modern 35 mm SLR is one of the most versatile cameras ever developed and there are probably few photographic tasks it cannot accomplish. Before the mid 1960s when the SLR began to dominate the photographic scene, a different type of camera held sway—the 35 mm rangefinder. And even today, there are still many photographers who prefer to use rangefinder cameras.

Strictly speaking, the term 'rangefinder' could be applied to some of the modern fixed lens cameras that use a rangefinder focusing aid, but these are more usually called compacts (see pages 462 to 465). The basic principles of the distinctive rangefinder focusing system are also covered on pages 610 to 611. This article covers rangefinders both old and new with interchangeable lenses.

Because rangefinder cameras have fewer moving parts than most SLRs, they are often quieter, smaller and lighter. They are therefore less conspicuous than SLRs and this makes them popular with certain types of photographic journalists and people interested in recording everyday life without distracting the attention of their subjects.

Some photographers find that the direct viewing system of a rangefinder helps them to achieve greater contact and intimacy with their subjects than SLRs. This can affect the style of their photography and the results can be seen in their pictures. For work in low light levels, the clear, direct viewfinders of rangefinder cameras cannot be excelled, since they are unaffected by the maximum aperture of the lens being used. They focus wide angle lenses with greater accuracy than an SLR, and do not suffer from annoying black out at the moment of exposure—something that can be particularly useful when taking pictures with flash. With an SLR it is possible to take a picture and remain uncertain as to whether the flash has fired because your eye is pressed up against the viewfinder at the moment it blacks out.

Some older rangefinder cameras are so sturdily built as to be nearly indestructible and are classics of camera design. Many people collect old models as an investment as early models are rare and quite valuable and their value increases as time goes by. Even so, old rangefinder cameras need not be bought



Rangefinder systems Although the range of lenses available for use with rangefinder cameras is more limited than that for SLRs, it is still adequate for most purposes, and more compact than any 35 mm reflex system

just as ornaments—there are many camera repairers capable of putting even the oldest rangefinder into good working order. Very old rangefinders may be comparatively rare, but they are likely to be around for many years.

The choice available

Though there are fewer rangefinders available now than there were in the past, you can still buy an interchangeable lens model, either new or used, at a reasonable price. The basic principle of

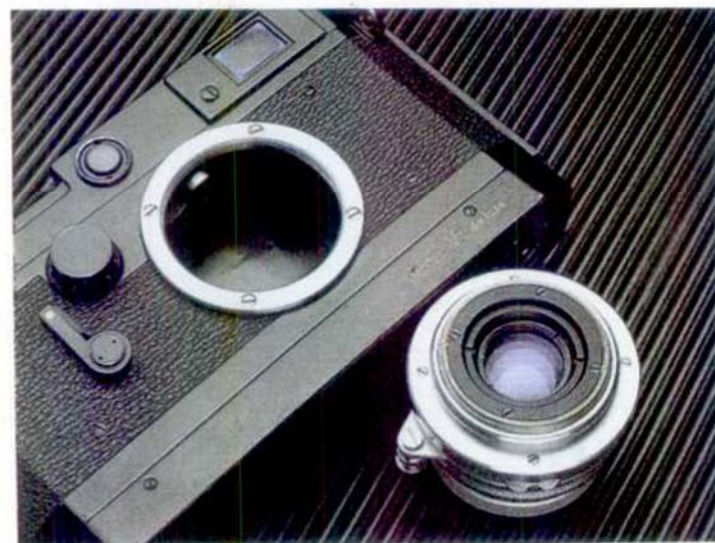
operation is too good for the type to die out completely, and some sophisticated models are still being made.

The most prestigious rangefinders in the world are Leicas. Leica was the first company to make 35 mm still photography popular, and many features of today's cameras originated with the Leicas of the 1920s. Both the cassette and the frame size of 35 mm cameras came from Leica. Their reputation is founded on high-quality, precision construction, and so their cameras have never been

cheap. Though a Leica can cost two or three times as much as a good SLR, many professionals consider them good value for money. You can find some examples of the more common older Leicas for a reasonable secondhand price and you could get a good used Leica for the same price as a new SLR.

In the 1930s, the main competitor of the Leica was another German-made camera, the Contax. Between them, Leicas and Contaxes have had an enormous influence on camera design. The Japanese camera industry which now dominates the world of photography achieved many of its early post-war

French cafe One of the most well known exponents of rangefinder cameras is Henri Cartier-Bresson, famous for his simple, true to life shots. It is in candid shots like this that the small, unobtrusive rangefinder camera comes into its own



Henri Cartier-Bresson/Magnum



Old and new Both cameras feature interchangeable lenses. The Minolta, shown top, has a bayonet mount, which allows lenses to be changed very quickly. The Canon, shown below, is an older, screw mount model

Dave King

successes simply by producing high-quality copies of Leicas and Contaxes. The best cameras produced in the early years of the Japanese camera industry were probably those made by Nikon and Canon. Both these types have developed a following in the world of camera collectors, but it is still possible to find good examples of these cameras at reasonable prices.

Many cheap rangefinder cameras come from the Soviet Union. After World War 2, Russia seized much camera technology from Germany as reparations. The most spectacular example of this was the shipment of virtually the entire Contax factory to the Soviet

Union. Ever since, the Russians have been making Contaxes and selling them at very low prices under the brand name 'Kiev'. An inexpensive Leica-type rangefinder, the Fed, is also made in the Soviet Union. Neither of these cameras has the same high degree of workmanship as their German originals, but they are sold at such low prices that this hardly matters.

Present day production of high-quality rangefinder cameras is now concentrated in two parts of the world, Canada and Japan. Modern Leica rangefinders are made in Canada, where a factory was set up after the war. A cooperative manufacturing deal between

Leica and Minolta in the 1970s led to the appearance of the Minolta CLE, possibly the most sophisticated 35 mm ever made. The choice of present day designs with interchangeable lenses is not wide, but those that are available are more versatile and easier to use than ever before. This is perhaps only to be expected as these cameras have the benefit of more than 60 years of technological development behind them.

What to look for

If you intend to buy a rangefinder camera, you are much more likely to contemplate buying a used camera than you would be if you wanted an SLR. Not only can rangefinders last longer than SLRs because they have fewer parts, but there may also be some features found on older cameras that are not available on current models.

Lens mounting is an example. Early Leicas had lenses that simply screwed into place. A cam-following roller in the camera body transferred distance information from the lens focusing mount to the rangefinder. The system was reliable and very sturdy, but meant that lens changing was rather slow. Leica discontinued their screw mount system and replaced it with a quicker bayonet in the 1950s, but in its time the Leica screw



mount was an international standard. The Leica thread survives today in Russian Fed cameras and it is also used for many enlarger lenses. Lenses to fit Leica screw mounts were made by many different manufacturers, and although those made by Leica were probably the best, some of those made by Canon and Nikon were also extremely good and can sometimes be found in camera shops. Although these lenses are older designs that were developed without the aid of modern computer technology, the problems of lens design for rangefinder cameras are somewhat simpler than those for SLRs, and as a result these lenses often give results that are as sharp as those from modern lenses. Canon rangefinders also take Leica screw lenses.

Contaxes are equipped with a much more convenient bayonet lens mount, but, unfortunately, old Contaxes are not as good a buy as old Leicas, Canons and Nikons because they were made with a very elaborate shutter mechanism which tends to become unreliable with time. Nikon rangefinders, however, combined the Contax bayonet mount with a Leica-type shutter, and these cameras are much more reliable. The Contax bayonet was in two parts. Standard lenses bayoneted directly into a rotating inner sleeve and connected to the rangefinder mechanism, while wide angle and telephoto lenses fitted onto an outer bayonet and turned the focusing mechanism indirectly through a special coupling cam. Because of this you should be careful when buying lenses for Contax, Nikon and Kiev rangefinders. There are slight differences between the coupling action of Nikons and Contaxes so that, although the lenses made by each manufacturer fit the other's cameras perfectly, they will not necessarily couple to the rangefinder mechanism properly. Nikon lenses designed for use on Contaxes have a small red 'C' on the front lens rim, and need minor modi-

Early Canon As the rangefinder is relatively simple in design, some cameras can last almost indefinitely, like this 20 year old Canon. A rangefinder in good condition can make an excellent secondhand buy

fication by a professional camera repairer to work on Nikon models.

The range of lenses available for rangefinder cameras is not as wide as that for SLRs. The efficiency of rangefinders compared with SLR focusing systems declines with longer focal lengths, and it is impractical to use a rangefinder with lenses longer than 135 mm. No better illustration of this can be found than the fact that some manufacturers, including Leica and Canon, made special reflex housings for use with long lenses that effectively converted their rangefinders into SLRs. In general, rangefinder lenses can be found in focal lengths ranging from about 21 mm to 135 mm, though very fast older lenses are not common. An exception is the $f/0.95$ 50 mm lens made by Canon in the late 1950s, which was the fastest lens ever made for 35 mm cameras. Unfortunately, the image quality is not very good, and the lens is more useful for soft focus effects than for normal picture taking.

While you are examining the lens mount of a camera you are contemplating buying, be sure to have a look at the shutter blinds that can be seen at the back of the camera when the lens is removed. One weakness of rangefinders is that there is no SLR mirror system to prevent the sun's rays from acting as a burning glass and scorching the shutter

The Leica This is perhaps the most famous of all rangefinder cameras. Based on a well-tryed design, each successive model has been updated, maintaining high standards of precision. The Leica is part of a comprehensive system of lenses and accessories

blinds if the camera is left facing the sun without a lens cap. Most shutter blinds are made of black rubberized fabric, and, with careless use, it is possible to burn holes clean through the shutters. Shutter blinds on Nikon SPs and some Canons were made of black titanium or stainless steel, and these are more resistant to heat. Nevertheless, scorch marks are a sign of careless handling and such cameras should be avoided.

Viewing and focusing

It is the viewing and focusing system of a rangefinder camera that is its most important single feature, and a variety of



approaches to viewfinder design have been used by different manufacturers over the years. The early screw thread Leicas had a slightly inconvenient viewing and focusing system. The subject is first focused through a rangefinder window, then the eye is moved to a separate viewfinder window to compose the picture. But most cameras have the rangefinder and viewfinder combined in a single window.

Bayonet mount Leicas, Canons, and the Minolta CLE all have viewfinder optics that make the scene through the finder look slightly smaller than life size. Although this shortens the effective base length of the rangefinder (see page 610) and reduces the accuracy of the focusing mechanism slightly, it makes it possible for the viewfinder to include a greater range of frame lines for different focal length lenses and for the rangefinder spot to have sharp edges so that split image focusing can be used on suitable subjects. By contrast, Nikons and Contaxes used viewfinders that showed the subject lifeseize, combined with a long rangefinder baseline. This means that photographers who preferred to view their subjects with their left eyes could simply hold the camera viewfinder in front of their right eye, and by leaving both eyes open see the viewfinder frame lines apparently superimposed on their field of view.

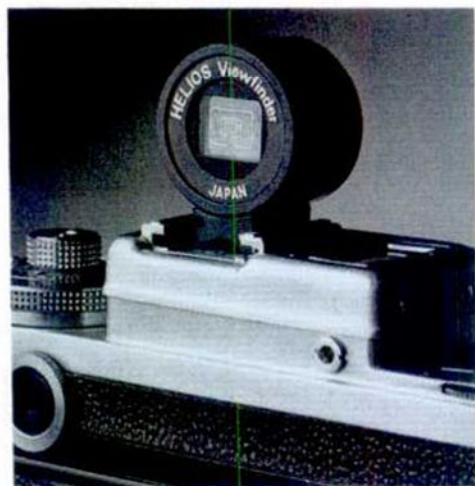
Some Canons had a special magnifying mechanism built into the viewfinder optical system that enabled the rangefinder spot to be seen very much enlarged. This increased the effective rangefinder baseline for greater accuracy.

A useful feature found on bayonet mount Leicas and the Minolta CLE is automatic frame lines in the viewfinder. The camera senses the focal length of the lens that is mounted with the help of a cam on the back of the lens, and shows appropriate frame lines in the viewfinder. Leicas also have a frame line selector lever to enable the effects of different focal length lenses to be previewed so that you can decide which lens to use.

The current Leicas, the M4-2 and M4-P, can be fitted with a very quiet winder that can transport film at two frames per second. Fitting a motor to older models can be more difficult. Although Nikon virtually originated the modern battery powered motor drive, their old rangefinder cameras need to be modified slightly if a motor is to be fitted, and the appropriate motor is in any case an exceptionally scarce collector's item. A spring-powered motor for early screw thread mount Leicas was made, though once again, this is now very much a collector's item. The special base mounted wind lever attachments that were made for Leicas and some other rangefinders are also rare items. These enabled the user to wind on the film with one hand and release the shutter with the other, thereby obtaining

framing rates comparable with motorized winders. Some Canons and Leicas were made with base winders built in.

The Leica M4-P automatically displays frame lines for 28, 35, 50, 75, 90 and 135 mm lenses, while the Minolta CLE shows lines for 28, 40 and 90 mm lenses. In both cameras the frame lines are automatically displaced slightly in the viewfinder to compensate for parallax errors when focusing on objects at different distances. In both the Minolta and the Leica the frame lines are illuminated by a separate window on the front of the camera. This system, though more complicated and expensive, gives



Auxiliary finder Cameras which do not show frame lines for different lenses require an extra finder as shown, when used with lenses other than standard

brighter frame lines in low-light conditions, but is not found on older or less expensive cameras.

One point about the rangefinder mechanisms of these cameras deserves special mention: although rangefinders are inherently sturdier than SLRs, they are not indestructible. And if a rangefinder camera is dropped or otherwise abused, the part that is most likely to be damaged is the finely adjusted, relatively delicate rangefinder mechanism itself. A rangefinder mechanism that is out of adjustment inevitably gives unsharp, out of focus pictures. But there is a simple check you can make to test for this. Set the focusing ring on the lens at infinity and then look through the viewfinder at a distant object, such as a television aerial or a tree. If you can see two images in the rangefinder spot, this means the rangefinder mechanism is out of alignment and needs servicing.

One feature found on only one interchangeable lens rangefinder is autofocus. The Minolta CLE achieves this by measuring the light reflected from a pattern on the shutter blind and from the film itself during exposure. This small, lightweight camera combines the best features of rangefinder technology with modern SLR electronics and is perhaps the ideal choice for someone who wants to take advantage of the portability, unobtrusiveness and speed of rangefinder cameras in poor or rapidly changing light conditions.

Do you want one?

Rangefinder cameras are not for everyone—if they were, they would never have been displaced by SLRs. But for those photographers who need the special advantages offered by interchangeable lens rangefinders, they are a camera type worth considering seriously. Before spending a lot of money on an expensive rangefinder it would probably be a good idea to buy or borrow a much cheaper fixed lens compact camera with a rangefinder focusing system. If this way of using a camera appeals to you, and your favourite lens focal lengths are less than 135 mm, then a rangefinder could be a sensible choice for you.

Minolta system

This compact outfit can be bought as a set. The components are all of very high quality

Russian cameras

Though not made to the same high standards as some others, they are rugged and inexpensive



Dave King



The flowers of Baden-Baden

A profusion of brilliant colours and delicate textures—flower festivals seem irresistibly photogenic. But they demand a selective eye

At an event like the Baden-Baden flower show, it is easy to become overwhelmed by the sheer colour and spectacle and shoot everything in sight. As Sergio Dorantes realized, it is important to resist this temptation.

The first step, therefore, is to obtain permission to photograph from the organizers of the event and, if it is a large event, get a programme so that you know exactly what is going on. Sergio

arranged his day carefully, deciding to concentrate on indoor shots in the morning and move out into the gardens in the afternoon when he expected better light.

For the morning session in the garden house, there were a number of technical problems because the light was poor. For good colour, Sergio wanted to use a fairly slow, 64 ASA (ISO) film, but this meant long exposures. A tripod was

Flower field A distant viewpoint and a telephoto lens help to flatten perspective and bring out the pattern of the flowerbeds; a figure in the middle distance completes the shot

Couple on a bench At popular events like this, candid shots are always worth looking for. **White flowers** For a simple, uncluttered image, Sergio concentrated on a single bouquet



Photographs by Sergio Dorantes



Wide angle
With a standard lens, this shot would have been dull, but a 16 mm lens creates a strong image
Watering time
The exhibitors can often make as good subjects as the exhibits
Brilliant blooms
Wide angle distortion helps to give an impression of the profusion of colour that pervades events like this

therefore essential—some of the shots needed exposures of almost one second.

Another problem in the garden house was the mixture of daylight and artificial light sources. To avoid changing film constantly, Sergio used daylight balanced film and fitted an 80A filter where the light was largely artificial.

Indoors, the dominant impression was of the brilliant blooms and the people, and the choice of composition was appropriate; close-ups of the blooms, singling out a few colours, predominate. Outside, it was the patterns of the flowerbeds that seemed most photogenic, so Sergio looked for ways of capturing these to best effect. For the outdoor shots, he used mostly telephoto lenses—300 and 500 mm—to give compressed perspective and shot late in the day when the light was best.





World of photography

Aerial photography

Aerial photographs are now a vital part of surveys and planning for projects as varied as orange growing, archaeological studies, traffic flow investigations, wild life management and pollution surveillance

During a routine practice flight in a war balloon in 1906, Lieutenant P. H. Sharpe took pictures of the ground at random. This military exercise turned into a landmark in the development of modern archaeology as the flight took him over the prehistoric ruins of Stonehenge on Salisbury Plain, England, and he brought back the first aerial photographs of an archaeological site.

The pictures were exhibited and published, fascinating archaeologists and the general public. They showed at a glance the entire complex of stones and earthworks, all previously known but never so plainly visible. Aerial photography quickly became an essential tool of archaeologists as their interests turned to reconstructing defunct civilizations rather than searching for isolated objects.

The clear patterns shown up in aerial photographs are now an indispensable part of investigations in fields as varied as espionage and ecology. They have revolutionized the map making industry and, as populations and living costs escalate, they become ever more important for management and planning of land and resources.

The history of flight and aerial photography go hand in hand. The first pictures from the air were taken of Paris in 1858 by the pioneer photographer Gaspard Felix Tournachon, who called himself Nadar. Nadar happened to be as enthusiastic a balloonist as he was a photographer so he combined the two interests. A cartoon of the time claimed he had raised photography to the 'highest of all arts'.

Kites were used for aerial photo-

graphy at the turn of the 19th century and the ravages of earthquake and fire in San Francisco in 1906 were recorded this way. Pigeons and rockets were also investigated but it was powered flight that made photography a practical and reliable tool.

In 1914, roll-film cameras were strapped to the sides of World War I aircraft so they could take pictures of enemy activity. Anti-aircraft gun crews tried desperately to down these spies in the skies and the photography industry worked just as hard to improve its equipment. In Germany the predecessor of the modern vertical survey camera was developed. It was a roll-film model

Land use This view of San Francisco was taken from a height of 17 km, on Kodak Ektachrome infrared film





Types of film

The film used in aerial photography varies according to the purpose of the survey being made. A wide variety is available and combinations of different emulsions may be used to achieve multi-spectral imagery of a subject. Some cameras take photographs of the same subject simultaneously on several different types of film.

For many purposes, black and white film, easy to use and relatively cheap, is satisfactory. Colour and 'false colour' film, sensitive to the infrared end of the spectrum, can also yield startling results.

Colour infrared film is invaluable for many disciplines because the colours it produces make many natural features stand out in 'false colour'. Healthy

Aerofilms

Ancient Samarra Only a very small town (top left) remains on the site of a city once housing several million

that took 250 four-inch (100 mm) square exposures on a 100-foot (30 m) roll of film. A propeller in the slipstream powered mechanisms to advance and cock the shutter.

The millions of air photographs taken in both world wars provided an information explosion for archaeologists. A pioneer was the Englishman Colonel Beazeley, who made several flights for the Royal Engineers in World War I over enemy territory on the Mesopotamian plain.

He noticed sharp outlines of canals and a rectangular layout of streets. Photographs revealed traces of an ancient city that ran for 40 km along the Tigris River which, Beazeley estimated, could have housed four million people. He had found the medieval city of Samarra. Built in the ninth century by Caliph Mu'tasim, the city had a lifespan of only 50 years and had lain under a light covering of sand ever since.

Since World War 2, the emphasis in military aerial surveys has been on surveillance from great heights. Details of the most powerful cameras and their uses are closely guarded military secrets but it is known that high flying reconnaissance planes can take pictures from over 15,000 metres, twice the height of Mount Everest. These are clear enough to show details such as parked cars.

Satellite scan photography is now widely used for large scale surveillance of land areas but the quality of pictures obtained is limited.

The US space programme led to the development of very specialized cameras, designed to take pictures of the moon. The technique involved reduces the distortion of straight lines when the camera is pointed downwards. One such camera, a 70 mm square Hasselblad, is used by the University of Cambridge, England, which has its own department of aerial photography.

Anthropological record These marsh dwellers' houses were revealed where the Tigris and Euphrates meet

Georg Gerster/The John Hillelson Agency



foliage registers as brilliant red whereas diseased or dying vegetation shows in a different hue. This phenomenon was first used in a military context. Trees and bushes cut down to camouflage equipment still look green to the eye but show as brown when photographed in infrared's false colours.

The advantage of being able to distinguish between healthy and dead or dying plants and to note the presence of pollution in water by studying infrared colour shots was quickly realized by ecologists, foresters and agricultural experts. Polluted water shows in a colour different from that of clear water because decomposing organisms or other foreign matter interfere with the normal reflections of infrared light.

Map making

Black and white film is usually adequate for map making, which is the basis for most current aerial photography. Most modern maps are based on aerial surveys and are more accurate, quicker and cheaper to produce than those compiled by traditional survey methods. The development of precision instruments for preparing accurate contour maps has provided a new means for the survey of large areas.

Aerial photographers use two basic angles of view—the vertical and the oblique.

Oblique views are usually taken with a

False colour A grid of ancient Roman roads at Silchester, England, shows through crops (red) and animal pens (blue)



hand-held camera, preferably from a low altitude. They provide a wide angle, perspective view in areas of level terrain, but mountains or rough ground present problems.

The vertical photograph is taken with an aerial camera pointed straight down at the earth's surface. Where continuous coverage is specified, the photographic flight is planned so that consecutive exposures will overlap about

Pollution Both air and water pollution show clearly on this view of a steelworks in the north-west of England

60 per cent of their width along the line of flight and about 30 per cent between adjacent flight strips. This pattern of overlapping exposures provides an image of each terrain feature from two different camera positions. As a result, any overlapping pair of exposures from a given flight line can be viewed three-dimensionally with an optical device known as a stereoscope.

The two photographic images, consisting of a left-hand and a right-hand view, are arranged under corresponding lenses of the stereoscope; the instrument 'forces' the left eye to look only at the left-hand photograph, while the right eye sees only the right-hand view. The result is a somewhat exaggerated three-dimensional effect created in the brain of the viewer. According to one map maker, looking at them is 'like hanging by your heels out of an aircraft all day.'

Stereo plotters create another illusion in the form of a black dot that appears to float over the image or lie on the ground depending on how the operator handles it. The dot, or floating mark, allows measurement of heights from photographs when placed over a feature, for example, the base of a tree or building where the height above sea level is known. If the plotter's foot wheel is moved in a certain direction, the mark appears to rise above the ground. It will appear to descend beneath the soil if the wheel is moved in the other direction.

Through mechanical linkages the operator traces points of equal height by keeping the floating mark in apparent contact with the ground while never allowing it to rise or descend. A pencil on a plotting table is connected to the movements of the floating mark through



a pantograph, so that contour lines are drawn as it moves. In the hands of an experienced operator, the floating mark can move at apparent speeds of over 100 km/h, tracing contour lines through hilly countryside.

No surveyor on the ground can ever match its speed, but the stereo plotter has not put them out of work yet. Ground-based observers are still needed to check the content of the maps, to get the place names of features appearing on them and surveying points obscured from the air like pathways through overhanging trees. Mapping in this way avoids damage to fragile vegetation and records areas that are difficult to get to.

Flying techniques are also precise

and equipment on board records the camera's angle from the vertical at each exposure so this can be accounted for when maps are being drawn.

The plane flies at a fairly low speed—about 120 knots—to prevent the image movement from blurring the picture. Favourable, steady weather conditions are extremely important.

Looking at the land

Among the more obvious uses of aerial photographs are road and urban land planning. These help traffic planners

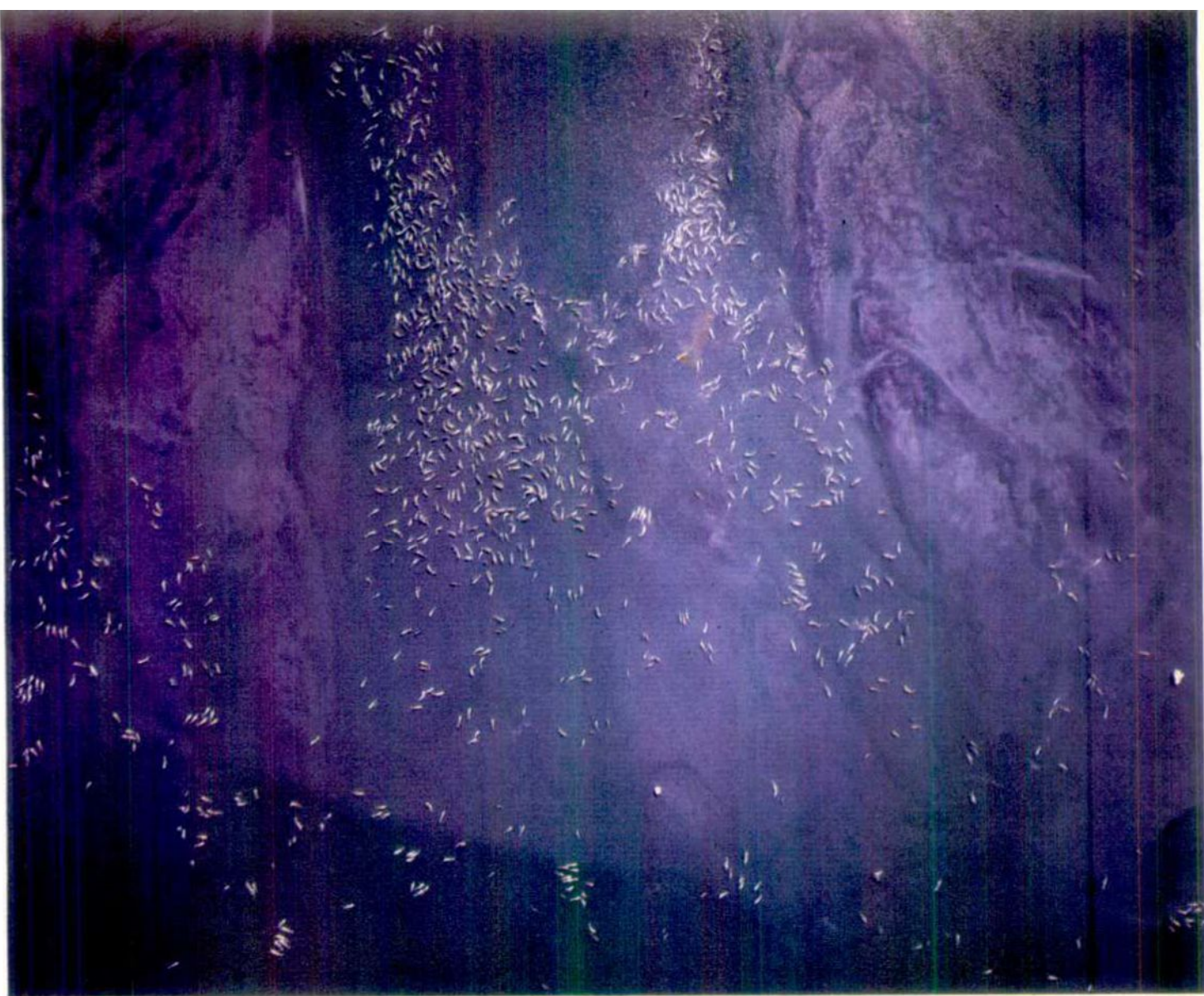
Photo mapping Special cameras are used to record precisely positioned vertical shots such as this one of central London



Courtesy Wild Heerbrugge



Aerofilms



J. Douglas Heyland

by providing a record of congestion and traffic flow at different times. For highway surveys, the basic task requires fitting proposed routes into natural terrain features in a way that will be most economical in construction.

Aerial photography is ideally suited also for evaluating topography, drainage, property values, soils, impeding vegetation, and special trouble spots such as where tunnels will be constructed.

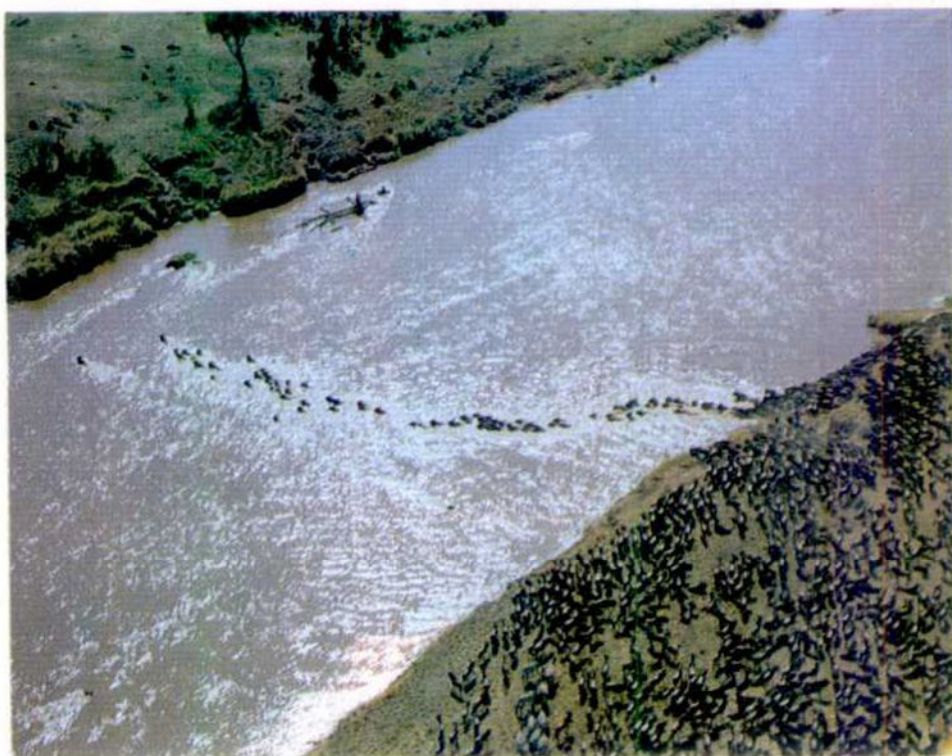
Photography of rapidly expanding urban areas, repeated at periodic intervals, can pay for itself many times over because of its value in discovering new taxable property. Such coverage has proved to be especially efficient for detecting new additions to residences or industrial plants, garages, swimming pools, new areas such as parking lots, and 'instant housing' comprised of mobile homes or prefabricated cabins. Local authorities can use this information as a basis for revised rates assessments.

International boundaries are also sometimes fixed by politicians negotiating around the table using aerial photographs. The disputed areas are later inspected and fixed on the ground.

Resource surveys

For the geologist, air photography greatly helps regional surveys designed to assess geological structure or mineral

Photo census This picture of the rarely seen beluga (or white) whales at their breeding grounds in Cunningham Inlet, Northwest Territories, Canada, was taken on a Wild RC-8 aerial camera using Kodak water penetration film. **Migrating wildebeest** Population counts by aerial survey are the most practical methods over vast areas of land



J. Pearson/Bruce Coleman Ltd



G. R. Roberts

Geological survey *A complex pattern of drainage in the San Francisco Bay. The white areas are salt deposits*

resources. Infrared aerial photographs have helped to map the oil fields of Alaska's North Slope and to locate mineral riches in the vast Australian interior. Now this photographic technique is being used to explore the geology of the earth's shorelines.

Gradual geological changes can also be recorded such as land-slips, soil creep, the flooding of valleys, silting of estuaries, erosion of coasts and shifting of sand dunes.

By studying aerial photographs, naturalists gain valuable information on such animal habits as the state of feeding grounds, the size of the herds and even on the work of poachers. By knowing how many wild animals exist in a certain territory and where they are, the authorities can establish hunting seasons and set 'bag' limits, which are regularly adjusted to fit the size of the herds.

Photographs at large scale also convey much information about the condition of animals and the composition of the herd by age and sex. Stock population counts are aided by infrared film because animals often blend in with their surroundings.

Each year, insects and diseases are responsible for the destruction of millions of cubic metres of standing timber. Aerial photography can help to speed up control measures or tree salvage operations by providing early detection of affected timber stands.

In previous years, forests and orchards attacked by diseases or insects would generally remain unnoticed until ground crews or aerial observers could detect a visual change in the colour of leaves or tree life. Today, multispectral photographic coverage may record incipient attacks or potential danger spots several days or even weeks before they are seen by aerial observation with the naked eye. When foliage is attacked by insects or diseases, one of the first detectable changes that takes place in the leaves is a loss of infrared reflection which shows up on infrared film.

The forester can also estimate crops by species and spot the outbreak of fires in remote areas.

Aerial archaeology

Besides making it easy to see and record recent changes on the face of the earth, air photography makes visible the past of mankind. An archaeologist can use aerial photographs to discern irregularities in the natural pattern of land in desert areas, especially under oblique morning or afternoon sun. In

Forestry *Infrared film showing insect infested timber in Oregon, USA. The blue-green areas are damaged trees shown among healthy red or pink trees*

cultivated areas the irregularities show up more in the type of vegetation. Scientists examined survey pictures of the Scottish lowlands, for example, and found 400 new sites in an area which had already been well investigated by both ground workers.

Because disturbed or transplanted soil is harder or softer than surrounding soil, plant growth is stunted or accelerated and variations in stem height and leaf area create different shadow patterns. More luxuriant plant growth may show up from the air as slight differences in colour, betraying better nutrients in the soil below. Good drainage created by stone foundations and buried stone walls sometimes has spectacular results. Poppies and daisies prefer well-drained soil and the stone foundations of ancient Roman forts are sometimes handsomely staked out by red and white garlands of flowers in wild meadows. Similarly, snow flurries may cling to one face of a low relief or melt faster over ancient excavations filled in with a different type of soil that warms up more quickly under the sun.

Some archaeological sites are ephemeral, appearing only under the right weather conditions two or three times a century. One such site appeared near Yeaver in northeast England in the drought of 1949. Meadow grass dried along the outlines of a 30 m long system of overlapping royal halls, thought to be the palace of Edwin, the Anglo-Saxon king of Northumbria from 616 to 633.

More sophisticated equipment will continue to expand the wide and varied uses of aerial photography. In the last two decades the use of satellite imagery has played an increasingly important part in this expansion—a far cry from the days when Nadar and others drifted over Paris taking photographs from hot air balloons.



NASA/Science Photo Library



Darkroom

Special print materials

Coloured bromide paper, and sensitized metal or cloth offer some interesting creative possibilities if you want to try different printing materials

Once you have perfected the art of conventional printmaking, you may wish that you could print on materials other than the conventional ones. In fact there are several special materials available from specialist suppliers which can add variety to your darkroom work. Processing is usually straightforward, and

the resulting prints often have textures unobtainable in any other way.

These materials include coloured bromide paper, polyester film, linen and aluminium plates. All are pre-sensitized, and can be processed in conventional paper developer. You can print from normal black and white negatives,

though different negatives may give disappointing results as the materials have certain limitations. The best results often come from printing high contrast or lith negatives.

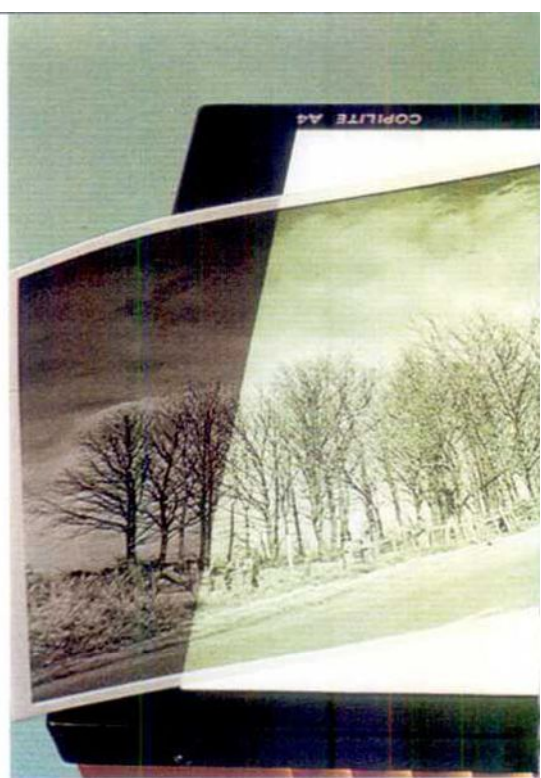
Coloured bromide paper

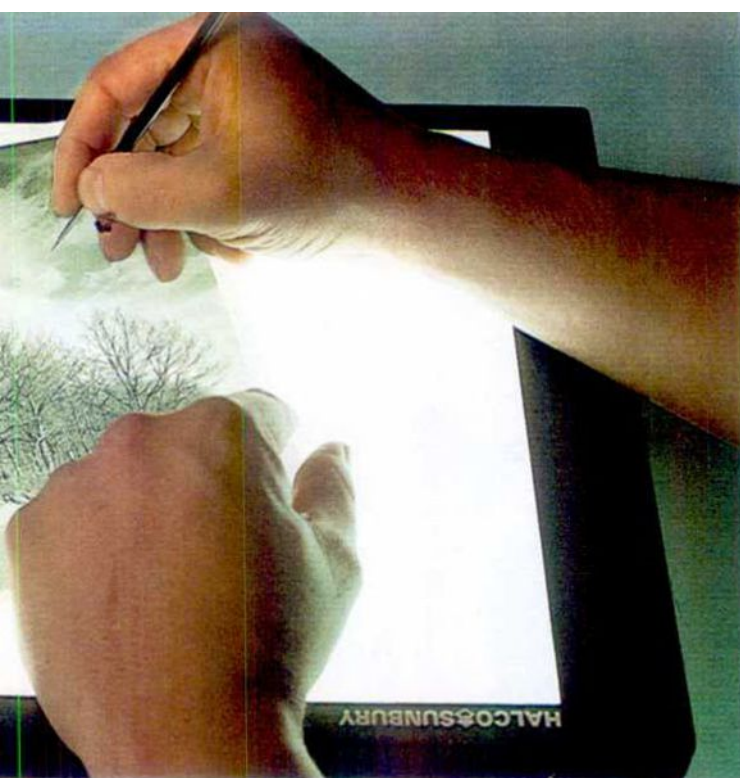
Coloured bromide paper has a conventional emulsion on a coloured paper base. Instead of producing a black image on a white background, it gives a black image against a coloured background. It is particularly suited to printing high contrast images because it helps to emphasize their graphic quality—continuous tone negatives do not usually have sufficient contrast to give a good image on this type of paper. Lith negatives tend to give better results, and from a good lith negative the effect can be very striking.

This paper is available in a variety of sizes and a wide range of colours. As well as 'pure' colours, it comes in fluorescent shades, and in metallic or iridescent ones such as silver, metallic pink and steel blue. You can buy it in large rolls and in packs of cut sheets, like conventional paper. It is usually available in only one contrast grade, but since high contrast negatives are generally used this is not so important.

Coloured bromide paper is a little slower than black and white paper, but it is processed in exactly the same way. It can be handled under a normal red safelight, and should be fixed, washed and dried just like any other bromide paper.

Colour choice The enhanced impact of a coloured paper base suits bold and graphic images best, but will do nothing for an image which is already weak in a normal print. Various papers in normal and fluorescent colours are available. These are processed just like ordinary bromide papers and can be etch-bleached for special effects to yield a white image on a coloured background





Opaline film *This material is handled and exposed just like ordinary bromide paper but is suitable for both frontlit and backlit applications. It can be coloured on the rear and retouched on its face*

Etch-bleaching

An alternative way of processing coloured bromide paper is to etch-bleach it. As its name implies, this process removes part of the print surface, turning it white. The bleaching solution destroys the gelatin wherever there is a silver image. This leaves the white paper base showing where there was an image, and the coloured emulsion where there was not. This technique works best with resin-coated material.

Line work is generally more suitable than half tone for this treatment. Not all colours of paper will bleach, and different brands have different characteristics in this respect. Most metallic colours do not bleach, or simply turn back to silver. You must always use fresh paper for this process.

The bleach solution is supplied in the form of chemicals for two solutions, A and B which are mixed in equal amounts. Working temperatures vary according to brand, and most solutions have a working life of about six hours.

When making a print which you intend to etch-bleach, give the paper very full exposure and development. Some makers recommend increasing the exposure by 20 per cent, to produce a strong silver image for bleaching. Fix and wash the paper as normal.

Make sure you are wearing rubber gloves before you start the bleaching process. Immerse the print in the bleach and leave it in until the silver image disappears. This should take between 30 and 90 seconds. Try not to agitate the solution—in this way you will prolong its life, as the silver is not deposited in it. Remove the paper from the solution gently, so that the silver image remains on it, and rinse the black image away under a tap. If the image does not

Photo-linen

Sensitized fabric can be used in many ways. The material must be handled carefully to prevent kinks.

When dry, it can be used for frontlit or backlit applications.

It may be ironed, on low heat, on its reverse side if kinks have to be removed

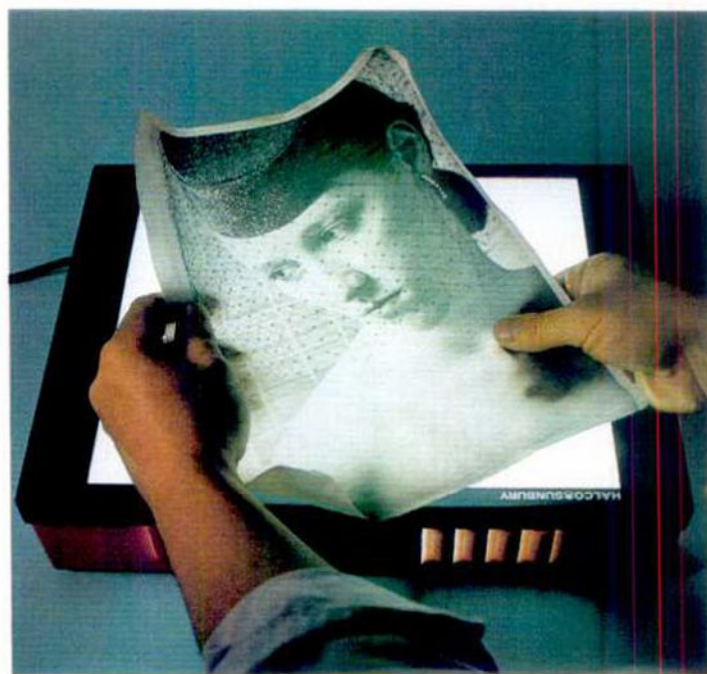
disappear completely, put the paper back into the bleach for a further period.

Place the print on a hard, flat surface and remove the last traces of silver and gelatin using a brush or a pad of cotton wool. Refix the print, give it a final wash, for five minutes, and dry it as normal. When the bleached image is dry, you may notice that the colour has become slightly lighter.

By leaving the print in the bleach bath for a shorter time than is necessary to remove the silver image, you can change the blacks into greys rather than whites. Always make sure that you wash all materials thoroughly after bleaching.

Coloured bromide paper has certain advantages over other materials which produce colour from black and white. It is available in finishes which normal colour paper does not provide, and gives a stronger and more consistent colour than obtained by other methods.

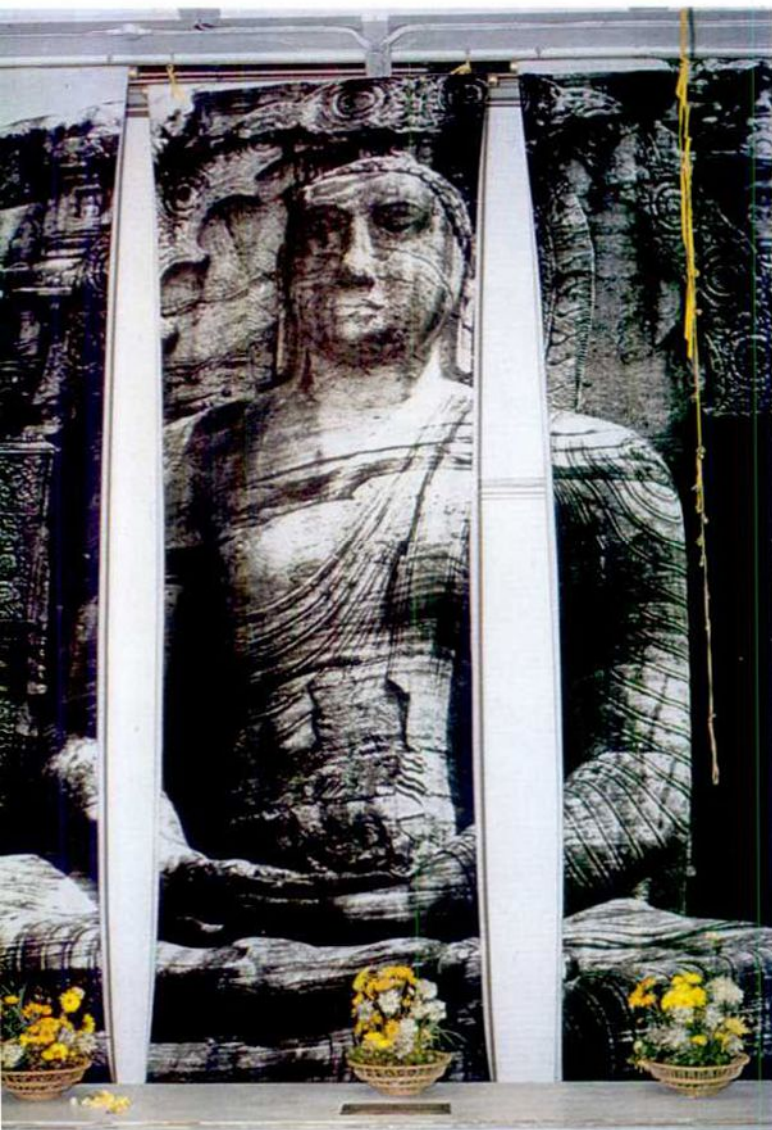
On the other hand, its colour cannot



be varied and you are restricted to a fixed range of shades which may not always be as subtle as you want. However, it is essentially different from other techniques of coloured monochrome printing, because instead of colouring a black and white image, you are printing a high contrast image on a coloured background.

This technique is an excellent way of giving a powerful mood to a picture. Portraits on appropriate coloured backgrounds can be very effective, and a landscape can be given added atmosphere on coloured paper. Coloured enlargements look very impressive when framed on the wall, and you can use them creatively for decorating rooms or even for brightening furniture panels.

Coloured bromide paper costs little more than conventional paper, but is a convenient and mess-free alternative to dyeing the latter.



Gavin Cochrane/Location courtesy of The Commonwealth Institute



Mounting fabric

You can use a latex type glue for mounting fabric direct on a suitable wooden board

Exhibition

Fabric prints are especially suited to this type of use, being effective and durable

'Opaline' polyester film

'Opaline' film is an extremely versatile material, suitable both for backlighting and for viewing by reflected light. It is a thin translucent plastic, coated on one side with a bromide emulsion. Its texture makes it opalescent so that it diffuses light and can be backlit without a diffuser or condenser. It can be easily retouched or coloured with ink, paints or dyes.

One version is matt on both sides, but this is primarily for technical use, such as making scale enlargements of maps, plans and other line subjects. However, the other type, which is glossy on one side, can be used creatively in several ways. Viewed normally it resembles a glossy black and white print but when backlit it becomes a continuous tone monochrome transparency. It can also be coloured on one side so that it looks like a normal black and white print but becomes a coloured transparency when backlit.

You can buy 'Opaline' and other polyester film in sheets, though the smallest size available is about A4. There are various speeds and contrast grades on the market and there is also an orthochromatic type, sensitive to green light

as well as to blue light.

Polyester film is exposed and processed in exactly the same way as bromide paper. Some films are the same speed as bromide paper, but others are faster, so you should make a preliminary test print as described on pages 164 to 167. The information on the film pack should be followed closely for correct exposure.

Develop the film in a dish as usual. Full development takes between 1½ and 2 minutes and as soon as it is over you should transfer the film to a stop bath then fix it normally. If you want to retouch the film, do not add any hardener to the fixing bath as this will harden the gelatin and prevent it from absorbing the dyes. You should then hang the film up to dry in a dust-free place.

To colour the film, first moisten the surface with distilled water until it is slightly tacky. This allows the colour to be taken up more evenly. Albumen dyes are advisable.

Retouching is best carried out on a light box, enabling you to see exactly the effect that it will give when projected.

When mounting polyester film, you should allow for slight heat expansion. It

is best to mount the transparency along the top and bottom or the two sides only to prevent warping.

The most frequent use for this material is in window displays and exhibitions but there are many ways in which you could use it for your own purpose. A photograph mounted on a frame and placed on a window sill would be backlit by daylight, and would look more effective than a straight print. A portrait would be especially enhanced by this form of lighting. You might even try mounting a print on a frame and incorporating it in a room lamp, so that the photograph is lit and also acts as a lampshade. Glass doors are another place you could mount a monochrome transparency. Indeed, any place in your home where it can be seen against the light is suitable.

Polyester film costs two or three times as much as conventional bromide paper.

Photo-linen

Another unusual and versatile material is photo-linen. This is a tough, flexible linen sheet coated with a high contrast bromide emulsion. You can print on it just like bromide paper, and like polyester film it can be viewed by reflected light or backlit. Once printed, it retains a durable photographic image and can be washed and even ironed without fading.

As well as having a unique texture, photo-linen is also very strong and elastic. This makes it suitable for many uses in exhibition work and shop window displays where it is often backlit. It is very effective when used in interior decor and, because of its flexibility, it can be adapted to a variety of shapes.

You can buy it in a number of sizes, from ten metre rolls to packs of ten sheets in 24 × 30 cm size, and costs about

the same as conventional colour paper. It may be white or cream, with a matt or semi-matt texture. The emulsion may be high contrast or normal, and has the same speed as bromide paper. A normal darkroom safelight can be used during processing.

You can use any developer suitable for bromide paper to process photo-linen. Sheets come in different thicknesses and you should make allowance for this when making the exposure in the enlarger. If the linen sheet is thicker than ordinary paper, pre-focus the enlarger on a sheet of thin card or two sheets of paper to make sure that your image will be in focus.

Make the exposure and process the sheet in a dish. Photo-linen is very pliable when wet, so you can use a relatively small dish. If you are developing a very large print, dilute your developer and increase development time in proportion as set out on the pack. You should use a stop bath after development, then fix and wash the sheet thoroughly.

Prints should be air dried whenever possible. Large ones should be pegged to a line or stretched out on an adjustable frame, while small ones may be dried on a print drying drum.

When dry, photo-linen may be ironed on the reverse side with a heat-controlled iron. You can mount it with a latex rubber type glue, or sew it into place. Once dry, it remains pliable but is stiffer than when wet. If you want it to remain very flexible, give it a final rinse in a solution of one part glycerine to two parts water.

Photo-linen is used in interior decoration for curtains, wall coverings and drapes, and attractive effects can be

produced by lighting from behind with fluorescent tubes. Theatre and film sets use it and it is especially effective if backlit with coloured light for special effects on stage. An enlargement can be coloured in by hand with oil paints or dyes so that a photograph looks like a painting. Alternatively, you could use a photograph as a base for a painting in its own right or for a whole range of artistic and graphic effects.

However, perhaps its most rewarding use is in simple photographic printing. As a texture it is unique, and many kinds of pictures are suitable for printing on linen. Portraits especially benefit from this kind of treatment as the roughness of the surface contrasts very well with the smooth gradation of tones given by the emulsion. At the opposite extreme, prints on linen from lith negatives are also very attractive, giving an effect rather like an engraving or a woodcut.

Printing on aluminium

You can even print your negatives on aluminium plates which have been made sensitive to light. These have various industrial applications, but they can be used very creatively for printing and graphic effects. They can reproduce both line and continuous tone work, giving very fine resolution.

There are various surfaces and thicknesses available. The plates are sensitized with a hard (grade 3) emulsion and since they are orthochromatic they must be used under a red safelight. They may be matt, semi-matt or glossy, and you can buy sizes as small as 9 x 12 cm.

Like the other surfaces, aluminium plates are exposed and processed in the same way as bromide paper using a normal enlarger or contact printer. Any

bromide developer can be used provided it does not contain caustic soda.

When you are exposing the plate, remember that it may be thicker than paper so you must make allowance for this when focusing and preparing the easel. You might also try contact printing from an enlarged negative. With lith film you would do this anyway.

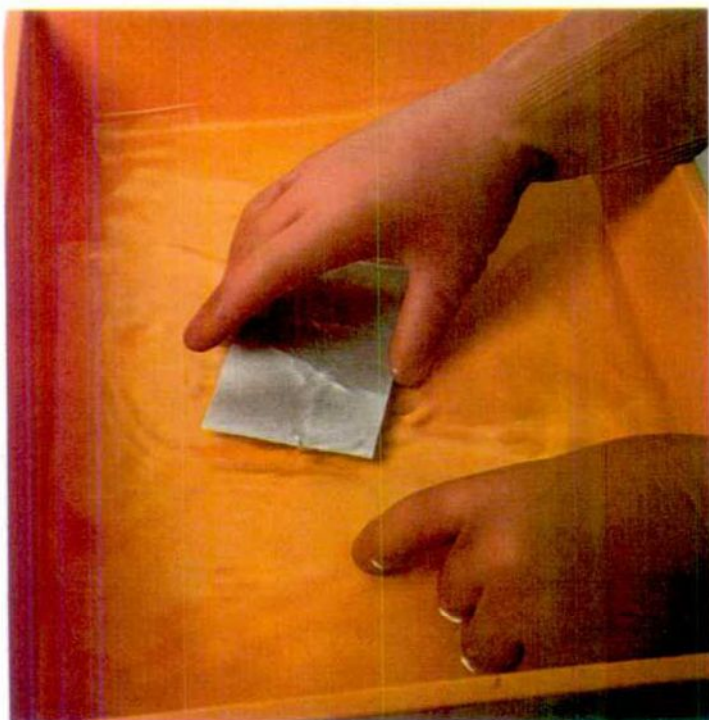
You should dry the plate on a draining rack. For maximum durability spray the dry plate with a special varnish which protects it from damage.

Aluminium plates have many uses. In the industrial field they are used for nameplates, instrument panels and dials in circumstances where a small number only are required and etching or screen printing would be too costly.

They are equally suitable for reproducing line, half-tone and continuous-tone images, and give very dense blacks with dull, metallic grey highlights. A print on an aluminium plate has a characteristic sharp quality with very high contrast. Image resolution is excellent showing very fine line and tone detail. The most delicate, soft areas of tone are faithfully reproduced, but with heightened contrast. For special effects you can even dye the metal.

A large aluminium print from a lith negative has a striking appearance rather like a print on metallic bromide paper but with a glossier surface. Aluminium prints with matt surfaces are suitable for framing and hanging on the wall as their surface does not catch the light too badly.

By contact printing with cardboard masks or plastic letters, you might also use aluminium plates for labelling or whenever you require neat, clear lettering on a durable base.



Processing technique Sensitized metal scratches easily and it is best to suspend the plate carefully in the processing solutions. Gloves should be used



Finished result The processed plate should be rinsed in a final bath containing wetting agent, then air dried. The plate can be used in a variety of unusual applications

Polarized light

Light is a complex phenomenon. Colour is only one of several aspects important to photographers. Another crucial feature concerns the way in which the light waves vibrate

Most people are familiar with polarizing filters, either as used for photography or as lenses in sunglasses. The way they reduce glare and reflections is useful in both applications, while in the case of photography they can also help to produce more saturated colours. But polarizers do not work in the same way as other filters, and to understand polarization, it is necessary to look again at the nature of light.

There are two aspects of light which are important when filters are involved—wavelength, or colour, and amplitude, or strength. Coloured filters work by restricting the wavelengths of light which can pass through them. Polarizers, on the other hand, affect the amplitude.

Light can be treated as a wave motion. One way to visualize the wave form is to imagine a cord, firmly fixed at one end and held at the other. By shaking the cord at one end, it forms a wave pattern. The amplitude is the height of the wave peaks, which is measured from the lowest point of the cord. As extra energy is applied the ampli-

tude increases. This corresponds to an increase in intensity when applied to light.

Viewed from one end, the cord forms a straight line, as it is vibrating in one plane only. Light which vibrates in this manner is called *linear* or *plane polarized* light. But, except in special circumstances, light vibrates in many planes, and so is unpolarized.

Types of filter

A beam of light can be polarized by using special filters. These work by restricting the plane of vibration of the light passing through them. Linear polarizers usually consist of crystals contained within very thin sheets of plastic. The molecules of the crystals form long straight chains, which act as conducting paths to absorb light of a certain polarization.

Such a filter transmits light waves vibrating in one direction while blocking light at 90° to it. Light waves in planes between these two are transmitted in varying amounts. Light which has been polarized in one direction cannot pass through a

filter polarized at 90° to it. The exception is deep blue light, which is less strongly affected by the filter. Filters are usually set in rotating mounts so that the plane of polarization can be changed.

The optical properties of polarizing filters are not perfect. More than half the incident light is absorbed, giving a filter factor of $\times 3$ to $\times 4$. In addition, some filters are not truly neutral in colour, and may need a weak colour compensating filter for really critical colour work.

There are two other types of polarization—*circular* and *elliptical*. When viewed end-on, the polarized wave forms these shapes. But viewed in perspective, the path of the wave is actually a helix (corkscrew shape). As a complication, the light can be right-hand or left-hand polarized, according to the direction of the rotation. Left-hand polarized light cannot pass through a right-hand polarized filter, and vice versa.

Circular polarizers work by including, in addition to the polarizer, a layer of *birefringent* material. This is

Stress patterns Crossed polarizers can be used to reveal stresses in plastic

material which twists the plane of polarization. Light from the subject passes first through the polarizer, so that it is polarized. It then passes through the birefringent material, and emerges circularly polarized. This is an advantage with cameras that use a certain type of TTL light meter (see page 280).

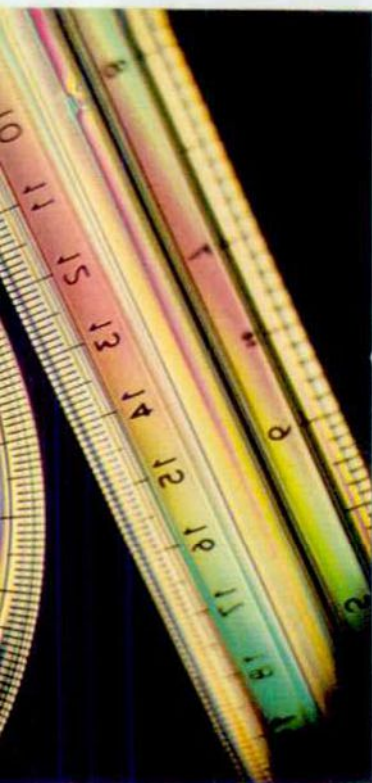
Natural polarization

Polarizing filters are man-made, but polarized light can also occur naturally. If a beam of natural light strikes a flat, smooth non-metallic surface at an angle, the reflected beam will be partially or wholly plane polarized. The extent of this depends on both the angle at which the light strikes, and the *refractive index* of the material—that is, its refractive power.

As most natural objects are non-metallic, most scenes contain a certain amount of polarized light. So a plane or linear polarizing filter can reduce some of the reflected light to improve colour saturation or remove reflections from shiny surfaces, such as windows. In this sense, the filter is not strictly a 'polarizer' but an 'analyzer', as it simply transmits just those components of light vibrating in the correct plane.



Trevor Wood



Paul Brierley

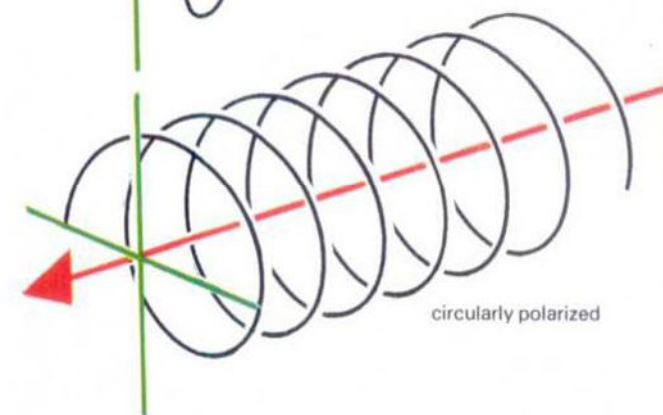
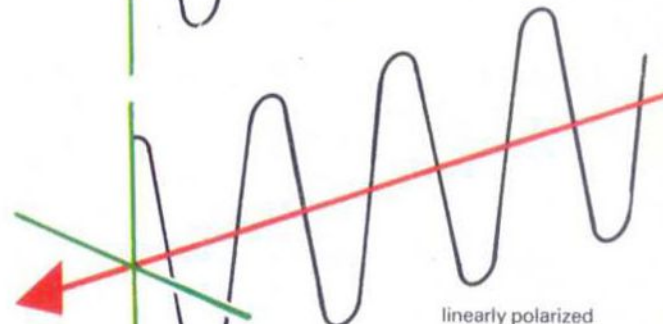
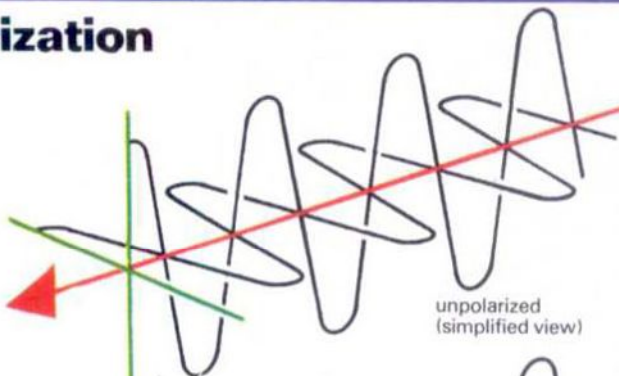
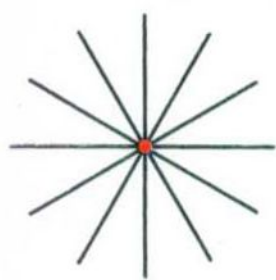
There are other photographic applications of polarized light, apart from eliminating reflections. Some quite ordinary materials, such as perspex and cellophane, are birefringent and can be used to produce colourful and dramatic pic-

tures. An item made from one of these (such as a perspex ruler) placed between crossed polarizers forms multi-coloured fringes within the material. These are produced by stresses in the object, so that various wavelengths of light are affected

in different ways. The result is an apparently luminous object standing out against a black background.

Wave vibration *Unpolarized light vibrates in many planes. Polarizers restrict the vibration to one plane*

Planes of polarization

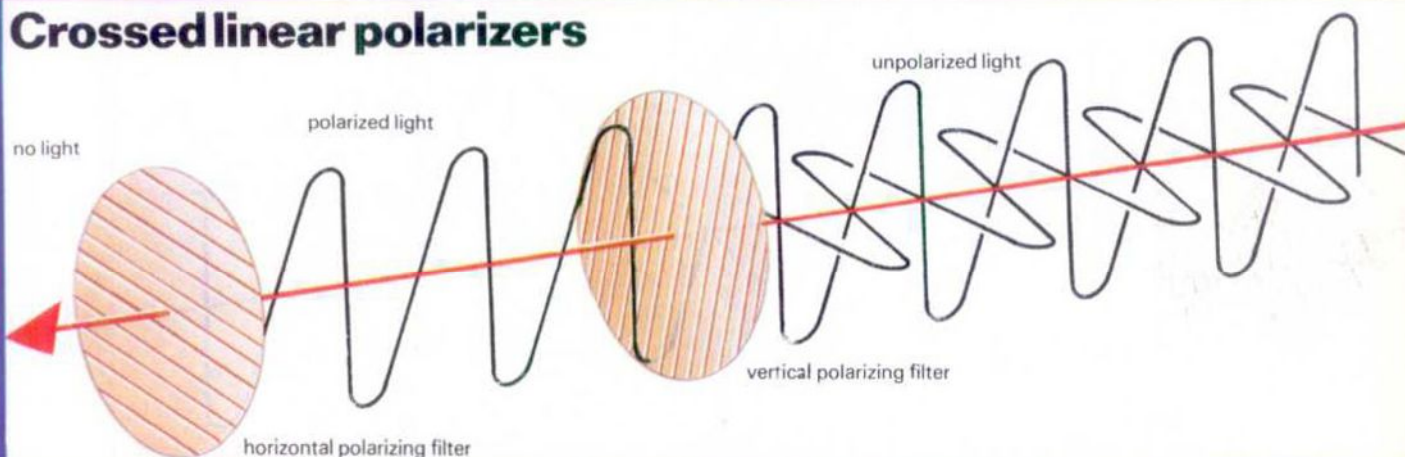


Natural light scattered by small particles, such as dust or gas molecules, may be polarized. The best example is blue sky. The light from an area of sky is polarized, the extent varying according to its location—the strongest effect is at 90° to the sun. A polarizing filter can remove some of this light to increase the colour saturation of the sky, or simply to make it appear darker.

In some cases, such as with a matt or dusty surface, polarized light can be depolarized by reflection. In the case of circularly polarized light, reflection can cause a change in the direction of the rotation.

Opposed planes *Crossed polarizers prevent light from passing through them*

Crossed linear polarizers

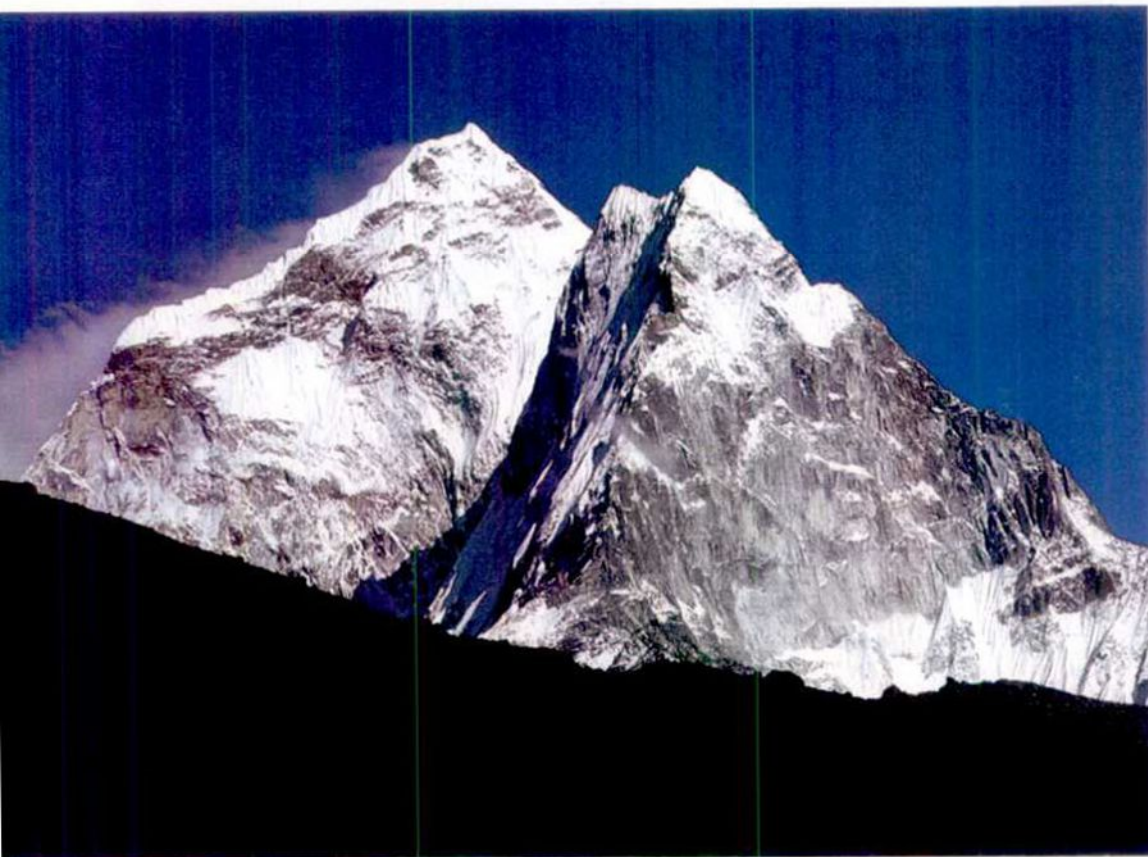




Creative approach

Mountainscapes

Offering breathtaking scenic views, spectacular panoramas and impressive detail shots, mountainscapes are ideal for the adventurous photographer



Suzanne Hill



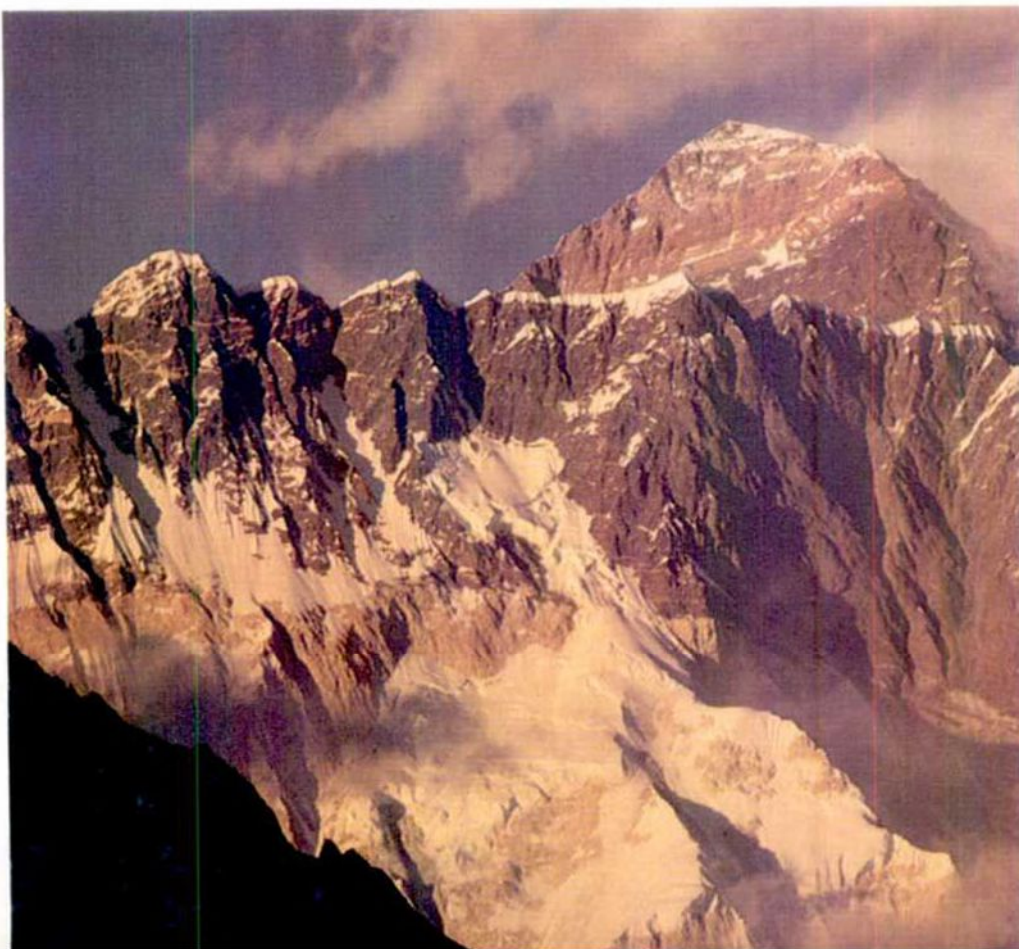
Alfred Gregory

Some people encounter mountains only rarely, on a skiing holiday or on a holiday visit. Others may live near a mountain range, and are able to photograph it in all its moods. Either way, mountains offer the potential for breathtaking photographs.

But to reach the top in mountainscapes it is essential to capture the mood of the mountain rather than scale the summit. Climbing may not be involved at all as some of the most dramatic vistas are those seen from far away. However, it needs considerable skill to turn a good view into an impressive shot rather than a hazy, shapeless landscape with no real centre of interest.

Think carefully about the aspects of mountainscapes that interest you most. These will naturally be dictated by what the subject has to offer. European ski slopes and their mountain ranges are quite a different proposition from rocky desert outcrops though their basic shape means some of the same techniques are necessary. But the moment you choose to photograph them, your location and the choice of lenses, filters and film are under your control.

The choice of black and white or colour film, for instance, will be dictated by the type of atmosphere you want to





Twin peaks Deep foreground shadow is used to focus attention on these snowy peaks. **Snowcap** Careful exposure will reveal subtle patterns in the snow. **Mount Everest** Late afternoon light brings a warmer colour to mountains

create. Black and white can emphasize the dramatic elements of the subject—the harsh outline of the mountain, thundery clouds hanging over the summit and shadows stalking over the landscape beneath. In colour this same scene may well appear gentle and pastoral, with muted colours and fluffy, white clouds.

If you intend shooting mountains from a distance, allow plenty of time to explore the surrounding area and study the elevations from a number of different viewpoints and under different lighting conditions. The time will not be wasted if you are pursuing a really spectacular shot. And if you are on a skiing holiday, conditions quite unfavourable for sport can make the ideal time for photography as many exceptionally dramatic mountainscapes are taken in stormy weather.

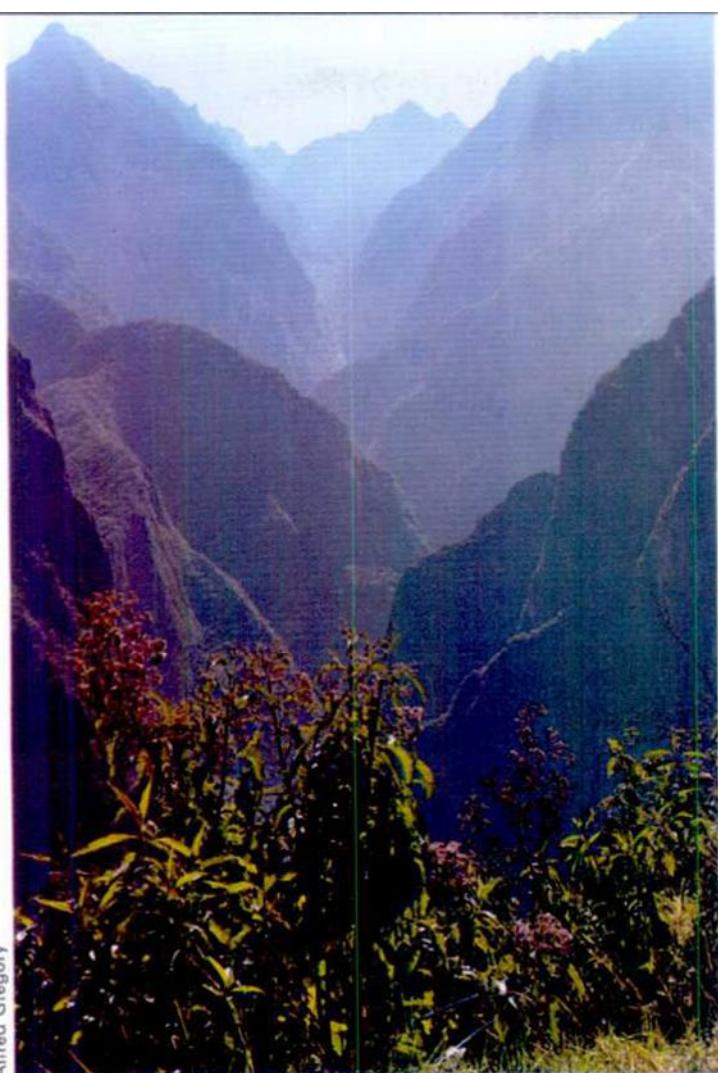
Many landscape photographers prefer to work in the early morning or late afternoon, when the light is strongly

directional, revealing a high degree of modelling. Dramatic effects created by sunsets and sunrises can be captured at these times. If you intend to concentrate on photographing mountainscapes during the first or last hours of daylight, a pale blue filter may be useful to diminish the excessively red cast of the sunlight at these times. Occasionally this unfiltered blood red effect can be very dramatic, particularly at sunset, but it may be better to confine this to the odd shot, rather than shooting a whole roll. Even dramatic colouring can become monotonous.

Strong sunlight is not necessary for shooting successful mountainscapes. Some of the most effective photographs are taken in the softer light of an overcast day, so do not be deterred if you encounter this type of weather. Mountain ranges are notorious for their rapid changes in weather and even at low levels you must be prepared for torrential downpours or heavy mists. While it may be impossible to see through, let alone photograph, in fog, a light mist can be used to great effect when creating moody and atmospheric mountainscapes. You may lose some clarity and detail in the final image, but you will gain a much more subtle and mysterious picture.



Jonathan T. Wright/Bruce Coleman Ltd



Mountains and flowers *A bright, sharp foreground colour contrasts well with a misty mountainscape beyond*

Certain times of day are characterized by misty conditions, especially summer mornings after a heavy dew deposit, and winter evenings after a clear day. On these occasions you must pay careful attention to colour balance, but often you will be able to achieve slightly unusual colour effects which are perfectly acceptable without being absolutely accurate. The colours and linear patterns produced when early morning sun struggles through heavy mist are in themselves unusual and can create striking images. Remember that the misty effect can be enhanced by slightly overexposing and that this has a tendency to desaturate the colours.

A sudden change in the weather or light can alter your subject tremendously, occasionally revealing a superb view in what had previously been an uninspiring scene. You should also be aware of the change in the seasons. If you find a particularly good view, you may be able to return at different times of the year to record the changes.

One of the most difficult impressions for the camera to record is that of the actual size and scale of the mountains themselves. There are several ways in which to suggest this—one of the most effective is to include other objects in your composition which relate to the size of the mountain. Tiny figures, isolated on a snowy peak, for instance,





will help to give a sense of the monumental scale of the mountain and a sense of the challenge and danger associated with mountain climbing. A building at the foot of a mountain can be photographed so that the mountain appears to tower over it. This type of shot is best achieved with a telephoto lens from a distance. Although some sense of depth may be lost in the photograph, a dramatic sense of scale can be achieved in this way.

It is not easy to represent both scale and depth very effectively in a mountainscape. Usually the introduction of foreground will increase the feeling of depth but may falsify the relative sizes of near and distant objects. The amount included in the foreground will be determined largely by your viewpoint.

A low viewpoint will accentuate the size of close objects, but will give a good sense of depth, as the eye is led towards the actual mountainscape by a series of foreground and mid-ground objects. A higher viewpoint may tend to exclude objects in the foreground but will provide greater scope for a panoramic view over the middle and far distance.

Wide angle lenses require considerable experience and care when used in shooting mountains as they can reduce an impressive range to a monotonous, tiny row. They are best reserved for shots taken fairly close to an isolated mountain peak when the foreground

Alfred Gregory



Brian Milne/Animals Animals/Oxford Scientific Films



Mountaineers *These minute figures on a ridge give an impression of both scale and of man's vulnerability*

Caribou *An out of focus and distant mountain range suggests the animal's environment effectively*

Church and cactus *Strong foreground subjects which contrast in shape and colour give interest to the dark hills*

detail is extremely interesting.

A telephoto lens, on the other hand, allows a more distant viewpoint, enabling you to isolate certain interesting features of the mountain as the main subject in your picture. The summit, for instance, may be one of those strange, crooked needle shapes which are not easily seen when you are closer to the mountain since your angle of view may be restricted. In this case, a better shot



Paul Joyce

could be achieved from a distance with a telephoto.

Once you have examined your subject from a distance, and from varying heights as well, you may feel that it is time to move closer and investigate the picture possibilities from the foothills of the mountain itself. At this point, particularly if it is a steep mountain with no easy approach rather than a rolling hillside, you should give some attention to your walking and camera equipment. When comfortable transport is not available, weight becomes the single most important factor and so you must think carefully about the equipment you are going to use. An ideal combination may be a wide angle lens and a telephoto zoom. Take plenty of film and a lightweight tripod.

As you approach the base of the mountain, the first thing you may notice is that the summit disappears from view. The foothills may not be the best place for impressive angles but they can yield some interesting subjects to juxtapose with what can be seen of the mountain in the background. For instance, the lower slopes may be cultivated and you can contrast the neatly ordered and gently sloping fields with the jagged rock faces above. A lake is a classic foreground for a mountainscape, with the mountain's reflection adding to the interest of the picture. As you proceed

Black Mountains *Choosing black and white film for certain subjects will give you a much more dramatic effect than can be achieved with colour*

to higher levels you may come across rushing streams or waterfalls. Both make excellent foreground subjects to contrast with a still mountainscape beyond.

Although scenery is your immediate priority, do not neglect opportunities for adding human interest to your photographs. Hikers, climbers or skiers can add considerable colour and interest to a mountain picture, and their relationship to the mountain is also an aspect worth exploring.

If you decide to go above the snow line, bear in mind that you will probably encounter mist and cloud. These conditions can produce stunning shots, but at this level mountains are dangerous places and you should be equipped with at least a compass and a map. Try to get shots which give a real feeling of the height you have achieved. As you look downwards from the edge of a steep cliff, the verticals will seem to distort. If they are used cleverly they will do so to great effect in the picture, increasing the impression of height.

If you are at cloud level, try to include them in your shots. A distant vista glimpsed through clouds can be just as effective as a mountain which is mys-

teriously shrouded in cloud. Experiment with time exposures to soften the clouds. Use the tripod and a spirit level, if you have one, to shoot two or three frames on the same plane so that you can join them up later to make a panoramic view.

The actual summit of a mountain is usually a barren and inhospitable place. Trees rarely take hold there, and the vegetation is sparse. However, you may encounter some animals and birds which manage to exist in high regions and these can make interesting subjects for the photographer with quick reflexes.

The higher you proceed, the colder it will get, and the winds can be both icy and severe. If temperatures drop well below freezing, keep the camera close to your body so that the film will not become too cold. Some colour emulsions react unfavourably in extreme cold, but black and white is more stable in these conditions.

Take advantage of these high places for views of other mountains and hills nearby. You can achieve quite a different perspective of another mountain from a similarly elevated viewpoint. Once again the early morning is an excellent time for this type of photography and you will find that serious practitioners may spend half the night preparing, perched in a tent, for that magical moment when the first rays of the sun strike across the sleeping landscape.

Assignment

Motocross

Dynamic action and bright colour combine to make motocross one of the most exciting sports for photographers and spectators alike



Assignment

Into the turn Jack used a 135 mm lens and a shutter speed of 1/500 sec. By including two riders, a sense of competition has been created. **World Champion** An 85 mm lens is useful for portraits of the riders

A motocross event is so visually exciting that, even if you have no interest in motorcycles, your photographic sense is almost certain to be aroused. The action, noise and colour mingle with the smell of the exhaust to attract the attention of even the most unmechanical spectators.

Jack Burnicle photographs all the major motocross events so he has become familiar with the individual characteristics of each track. Nevertheless, arriving at Beuren, near Frankfurt, the first thing he did was to walk around the track to see if any changes had been made and to decide on his viewing positions. Each track has sections where the action becomes more dramatic—for instance a sharp narrow bend following a straight or a hump where riders take off into the air.

Like most other sports photographers, Jack also likes to watch the warm-up sessions to plan his shots for the main event. This may be to decide on viewing angles or points for prefocusing. He generally prefers to shoot from a low angle and finds that this produces more



dynamic results.

During the race itself, the slower riders are very useful. Jack explained: 'They allow you to plan the shots of the faster riders before they appear. You can decide whether or not a shot ought to be vertical or horizontal. You can also prefocus—actually changing focus just

before you shoot never works with this kind of thing.'

Most of these shots were taken with 85 or 135 mm lenses. Jack finds that these offer just the right characteristics—limited depth of field to lift the main subject off the background and focal lengths that allow you to fill the frame with action. In motocross, photographers and spectators can get relatively close to the riders and longer lenses are usually too tight. Jack also advised, 'In shots of single riders, the main subject must dominate the frame, otherwise the shot will not have impact. Another type of shot though, includes more than one rider and allows you to create a sense of competitiveness.'

Jack advises people unfamiliar with this sport to learn to 'read the race'. Once you have become familiar with the riders and the course you can, to some degree, anticipate action so that you are

Riding gear There is more to shoot than the riders and their machines—here, Jack used his 85 mm lens for this almost abstract shot of some clothing outside a rider's tent.

Supporters The teams and the crowds are also promising subjects





in the right place to photograph something like a change in position among the leaders.

Another piece of advice Jack offered for newcomers was to take along some camera and lens cleaning equipment. Loads of mud and grit get thrown around during those events and they can easily ruin photographic equipment. He also pointed out that with any action sport you run the risk of getting a few blurred images. You should make several attempts at each shot 'just to make sure'.

Head over heels

By 'reading the race' you have a better chance of anticipating where dramatic moments are likely to occur.

Foot down A medium telephoto lens and a good vantage point allowed Jack to fill the frame with bike and rider





Specialist colour films

Some types of film are designed for specialist or professional use. How do they differ from 'ordinary' films—and what exactly do they have to offer the amateur?



Kim Sayer/films courtesy of Kodak & Agfa

The range of colour films on the dealer's shelf is usually restricted to those which are most popular for amateur use. But there are other films available, in both colour and black and white, which you might find worth using on occasion. These are only stocked by the largest dealers, or by professional suppliers. In some cases it may be necessary to obtain them on special order. Some of the films are available in 35 mm cassette form, in the normal exposure lengths, while others may be sold only in bulk

form, and must be loaded by the user into reusable cassettes.

This article deals with colour films suitable for use in the camera. Black and white films are covered elsewhere.

'Professional' films

Many films are described by the manufacturers as 'professional', even though they are basically very similar to their amateur counterparts. Such films as the Ektachrome series are sold in a 'professional' form, for example, as either

Special films for special purposes.

A wide range of such films is available, most of them produced by Kodak. Each is designed for a specific purpose and would give widely different results if used to photograph identical subjects

cassettes, roll films or sheet film.

The main difference between 'professional' and 'amateur' films lies in the way that they must be stored. It is expected that an amateur film will spend some time on the dealer's shelf, some

time in the amateur's gadget bag, often a considerable time in the camera, and then possibly some time before it is returned for processing. At all these stages, it may be subjected to extremes of temperature. No colour film can maintain perfect colour balance over a length of time, so the films are made to give their optimum results a matter of six months or so after manufacture. They carry a 'process by' date to indicate when they will start to suffer from poor quality, if stored at average temperatures.

Professional films, on the other hand, are designed to give their best performance shortly after manufacture. They must be stored at low temperatures, in order that they maintain this optimum performance until used. Once taken from storage, they should be used within

a short time, then processed very soon afterwards, to prevent fading of the latent image, or latent image regression. These are the conditions under which most professionals work, and the films therefore give highly consistent results.

In addition to the normal information, each batch of professional film is provided with specific speed data by the manufacturer. A batch of Ektachrome 200 Professional, for example, has a nominal speed of 200 ASA (ISO) but may be rated at, say, 250 ASA. Manufacturers also provide supplementary filter information with professional tungsten film. Sometimes a correction filter may be suggested for a professional tungsten film for 'long' or 'short' exposures.

Some professional films are described as 'Type S' or 'Type L'. These are designed for either 'short' or 'long'

exposures respectively. Short exposures are those encountered in normal daylight conditions, in the range 1/10 to 1/100 second. Long exposures are those often used in artificial light, for such purposes as advertising shots, in the range 1/10 to 30 seconds. Such films are made by both Kodak and Agfa, and may be either colour negative or slide films.

Infrared colour film

Perhaps the most popular specialist film available to the amateur is Kodak Ektachrome Infrared Film. Intended for military, land survey, medical and archaeological uses, it gives transparencies in false colours when used for everyday purposes.

Its three colour layers produce the same colour dyes as other films, but the sensitivity of each is shifted along the spectrum. Instead of being sensitive to blue, green and red light, it is sensitive to green, red and infrared. The film must be used with a Wratten 12 filter to remove blue light.

Intended to detect peaks in the amount of infrared light reflected by an object, its unusual colour response makes it popular for creating surreal effects. Techniques for infrared photography are explained in a subsequent article.

The film is available in 20 exposure 35 mm cassettes, at a cost some 20 per cent higher than conventional colour films. Its main drawback, apart from its limited availability, is that it currently requires the obsolescent Kodak E4 process, only available from a small

Infrared film The infrared shot (below) emphasizes the high infrared reflectiveness of vegetation, which appears green on normal film (left)



number of laboratories, and now almost unobtainable in kit form.

Infrared film was originally designed for aerial photography, so its contrast is very high. This means that its exposure latitude is very small—less than half a stop either way. With a yellow Wratten 12 filter in front of the lens the effective speed of Ektachrome Infrared film is 100 ASA.

Photomicrography film

Kodak's Photomicrography Colour Film 2483 is a very high contrast film suited to the kinds of image seen through a microscope where many stained specimens have very low contrasts of tone and colour. Its speed is 16 ASA in daylight, making it the slowest camera film available. But as photomicrography uses tungsten lamps for illumination, its speed drops to only 4 ASA when the necessary Wratten 80A colour conversion filter is used. Although balanced for use by daylight or electronic flash, it tends to suffer from colour casts, because of reciprocity failure problems at exposure times longer than 1/10 second. Outdoor shots often have a generally blue cast, and the high contrast and colour saturation make the reds reproduce particularly strongly.

Photomicrography film is available only as 35 mm 36 exposure cassettes. Like infrared film it gives colour slides after processing through the obsolete E4 process. Apart from the use of this film for its intended purpose of micrography, it can give strangely coloured, high contrast images when used in the camera, and may also be useful for copying line drawings in colour.

Like most specialist materials, micrography film should be kept in a refrigerator

before and after use. If you want to use this material and your camera's film speed control does not go down to 16 ASA, set it to 32 ASA—often the slowest setting—and give 1 stop extra exposure, either manually or using a '+1' exposure compensation control. As with all high contrast material, the exposure latitude is no more than half a stop either way, so you should bracket your exposures.

Slide duplicating film

Kodak's Ektachrome Slide Duplicating Film 5071 is a slow speed, low contrast film of high resolving power that is used for making facsimile copies of colour slides without the usual contrast increase that is inevitable when making copies of slides on conventional film. It is only available in bulk lengths of 30 metres for 35 mm camera use. Though it must be specially ordered through a dealer it usually works out at only half the cost of ordinary camera film. It can be processed in the normal E6 chemistry used for other Ektachrome slide films, but you should let the laboratory know that your cassette has been loaded from a supply of bulk film.

Slide duplicating film is balanced for a colour temperature of 3200 K, and is ideal for simple slide duplicators used with a photoflood as a light source, or with some professional bench duplicators. Slide duplicators that use electronic flash are less satisfactory as you would need an 85B conversion filter. In addition to this, the flash duration of 1/1000 second is less than the optimum 1 second

for which the film is balanced.

Although the film is balanced for tungsten light of a colour temperature of 3200 K, additional filtration is necessary when making duplicate slides, in order to correct for the different types of film being copied. Kodak recommend the use of filters with each batch.

Used in the camera for general purposes, the film gives low contrast results which for most subjects will be disappointing. A sheet film version, Kodak Ektachrome Duplicating Film 6121 is available in sizes from 4 × 5 inches to 20 × 16 inches. You could use this to make large transparencies for display from 35 mm originals.

Internegative film

Kodak's Vericolor Internegative Film 6011 is a colour negative film for making negatives from slides.

Such a negative is known as an 'internegative' and can then be used to make a print in the normal way. This film is really for darkroom use and is only available as 35 mm film in 23 metre rolls and in sheet film sizes as Kodak Vericolor Internegative Film 4112 (Estar Thick Base). It would be possible to use it in a 35 mm camera in much the same way as duplicating film. In practice, its original function, that of producing a negative for prints from slides, has been largely superseded by easier reversal processes such as Ektachrome R14 or Cibachrome paper.

Internegative film is balanced for a colour temperature of 3200 K and recommended exposure times are between 1/10 second and 30 seconds, with an optimum of about 10 seconds. It is processed in normal C41 chemicals, as used for conventional colour

Photomicrography film (below), used for photographing low contrast images through a microscope, produces more contrasty pictures than normal film (left)



negative film processing.

One unusual property of internegative film is that each of the normal three layers of the emulsion is a mixture of a fast, low contrast emulsion and a slow, high contrast emulsion. This is intended to cope with the high contrast of the original colour slide without the need for contrast reducing masks. The fast emulsion records the mid tones of the slide at a reduced contrast, while the slow layers record only the highlights but maintain a higher contrast for better reproduction. This means that the film has the unusual property of offering a contrast increase as the exposure time increases, the slow emulsion then playing more of a part.

Because of its special properties, another application of internegative film is in copying colour line diagrams for making colour prints.

Vericolor Slide Film 5072

This film is made for producing colour slides from colour negatives and it is only available in the same lengths as slide duplicating film mentioned earlier. It is handled and treated in much the same way as colour paper, except that it may be used in a camera or slide copier rather than in the enlarger. It is a high contrast film with its colour balanced for 3200 K and an exposure time range of 1/4 second to 8 seconds. As in conventional colour printing, you must determine the appropriate filtration by means of tests for each negative. A suggested starting point for a Kodacolor II negative

Slide duplicating film (below) is intended for photographing high contrast slides and the results are lower in contrast than normal film (left)



is 30 Y + 50 M for a dichroic head enlarger.

Vericolor slide film is processed in C41 chemicals but if the chemicals are used more than once the replenishment rate has to be adjusted and an additive used in the colour developer. Because of this film's high contrast properties, it can be used to copy black and white text to make colour line slides for titles or captions. If it is 'flushed' during development, it can give unusual Sabattier effect images (see page 754).

Kodak 5247 film

Until recently, this film was of little interest to the amateur. It is a 35 mm movie negative film, used in the camera for making feature films. It is normally available only in bulk, the smallest length being 30 m.

Some laboratories in the US and Canada, however, are now loading this film in normal 35 mm cassette lengths. The negatives, once processed, are suitable for both print and slide making. The prints are made as normal, while slides, if required, are made by contact printing on release print film, the same film that is normally used for making films for release to cinemas.

The main advantage of the film is that it can offer either prints or slides, though the quality of either cannot be expected to be as high as when using the material designed for the task. In addition, the film can be rated at 100, 200 or 400 ASA, with appropriate processing. This is a common feature of the film when used in movie making.

The film is balanced for a colour temperature of 3200 K, but the laboratories who reload it claim that it can be used in daylight or fluorescent light with

no further filtration. Ideally it requires a Wratten 85 filter when used in daylight, the speed being reduced from 100 ASA to 64 ASA.

The process, while similar to the standard negative C41 process, has to be modified to remove the special black 'rem-jet' anti-halation backing. If a normal C41 process is used, the backing will not be completely removed and the chemicals will be spoilt. The film must, therefore, normally be processed by a lab accustomed to dealing with it.

It is, however, possible to process the film at home using C41 chemicals if the backing is first removed by rubbing it gently, in total darkness, with a cloth soaked in a 5 per cent solution of sodium carbonate.

The release print film used for making the transparencies is processed in Ektacolor 3 print chemicals.

However, the use of 5247 film for still camera photography is not encouraged by Kodak. Certainly there are a number of problems involved. First, the exposure and colour balance are adjusted for 1/50 sec—the normal movie camera exposure. Second, it is more difficult to process than still colour negative film. Third, it does not have all the anti-scratch layers of still films intended for use in cassettes.

Generally, it is true to say that still negative films are more suitable for still camera photography since they include a family of compatible chemicals, paper and print film suited to the production of prints or slides.

Kodak 5247 film (below) produces acceptable images but they lack the sharpness and clarity of those taken on normal film (left)



Improve your technique

Setting up a studio

For a careful controlled approach to your subject, a studio is a must. But it need not be a permanent fixture—even a corner of a room will do. So how can you set up a room for studio use?



Kim Sayer

Photographic studios take many forms. Some are as vast as aircraft hangars—big enough to hold several buses with room to spare, others are small enough and light enough to be carried around on photographic expeditions—the American portrait photographer Irving Penn once built a tiny, tentlike canvas studio, which he took with him when photographing primitive tribal people.

Whether grand or humble, though, a studio has only one purpose—to give the photographer more control over the way a picture is made. This is achieved by protecting subjects from the elements, providing a support for backgrounds, and permitting controlled lighting of the subject.

A studio at home

Very few amateur photographers can afford the luxury of a purpose-built studio, and most people have to make do with a room that is less than perfect for photography. If all the rooms in your house seem too cramped, or unsuitable, do not despair—take advantage of what you have got. Your studio may double as

Full time studio *If you have a big house, you may be able to convert one room into a permanent studio.*

Tungsten or flash? *Quartz lamps are cheaper to buy, but get very hot and cost more to run than flash*

a living room, or even a garage. Despite this there is much you can do to create a successful working studio in almost any room. So, what should you look for?

Choosing a room

Although you can take photographs in a room of almost any dimensions, your photography will be much easier if the scale of the studio matches the scale of the work you do regularly. There is no sense in having a huge studio if you only ever photograph small still lifes. On the other hand, if your main interest is portraiture, you may need quite a large room, where you can move back from the model for full-length portraits. If you want to use rolls of coloured background paper, your room must be wide enough to fit these in. There must also be space at either side, so that you have room to



roll up the paper and fit lights in. Background paper—also called seamless background and Colorama—is made in standard-sized rolls 2.74 metres wide, and you need at least one metre of free space either side. Your studio should be at least five metres wide if you plan to use background paper rolls. These can, of course, be sawn down to a smaller



Studio at home
You can set up a studio with a minimum of equipment and space. Often it is just a question of pushing the furniture aside and setting up a couple of lights. The room can be quickly restored to its normal role when the session is finished.

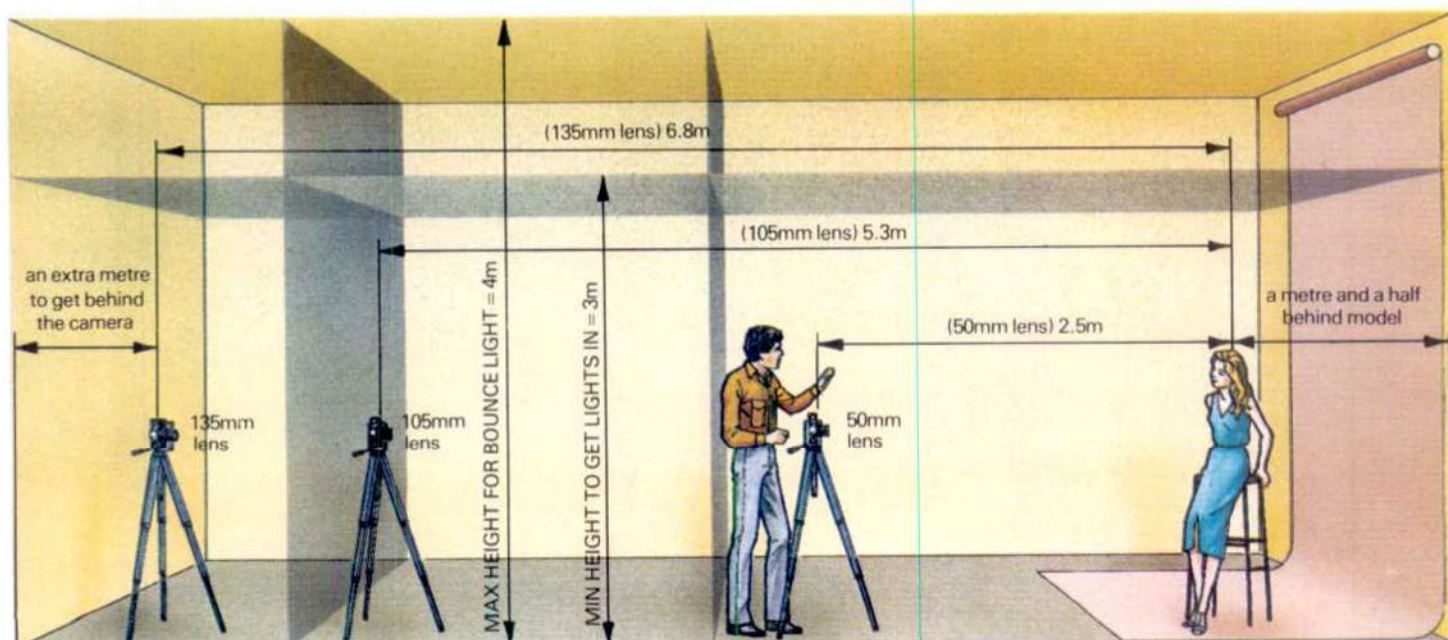
The ideal size
A bigger studio gives you scope to shoot with longer lenses

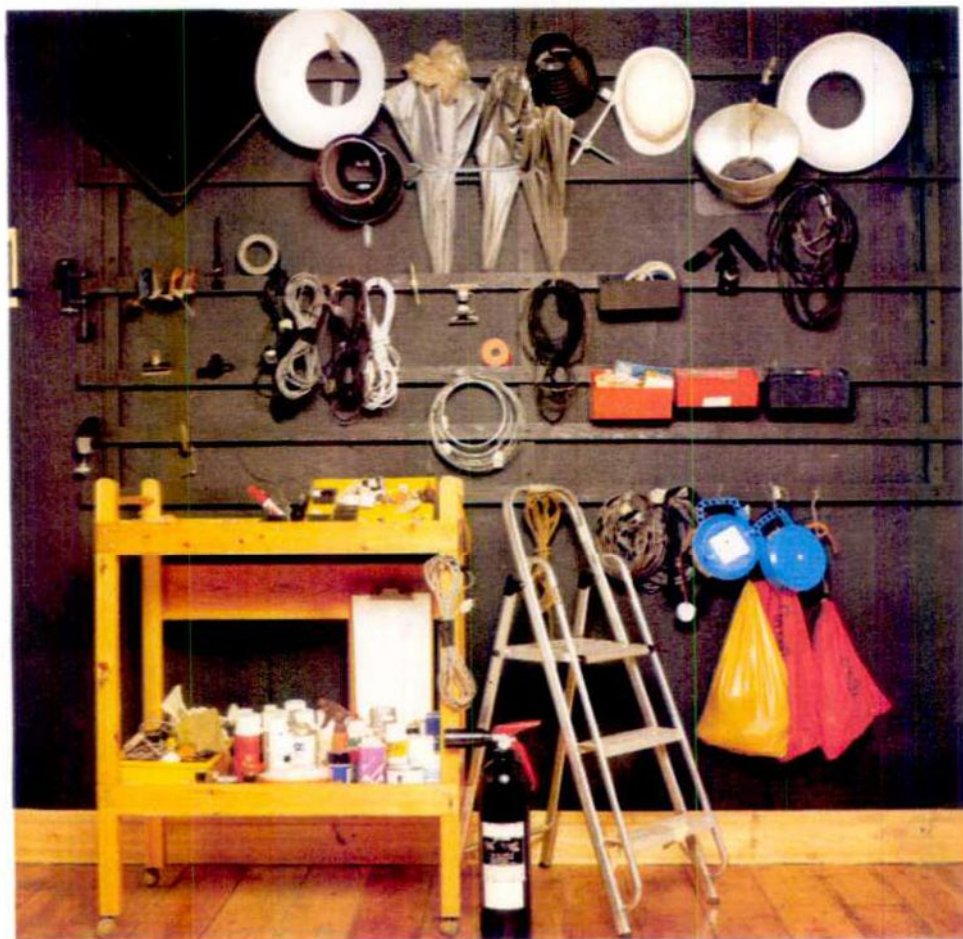
size so that they will fit smaller rooms, but this is rather expensive and wasteful.

The length of your studio will dictate the largest subject you can photograph, but it will also influence the focal length of the lens you can use. To get an idea of space, think of how far back you need to stand to take a full length portrait. With a 35 mm camera turned in vertical format and fitted with a standard lens, the head and feet of an average standing figure will be tightly framed when the camera is 2.5 metres away. With the same subject and a 105 mm lens, the camera must be positioned 5.3 metres away and with a 135 mm lens, 6.8 metres. These distances are not true room lengths, because they allow no space for the photographer to get behind the camera. There must be sufficient space behind the model, too, so that shadows do not fall on the background, which often has to be lit separately. Allow an extra metre behind the camera, and at least 1.5 metres behind the model. Further, to avoid very tight framing, the studio needs to be even longer by a metre or two.

There is no real alternative to a long, wide studio if you want to use longer focal length lenses. It is no solution to choose a short lens such as a wide angle because this simply introduces perspective distortion of the subject. Compare the two portraits on page 295, and you will see that the photograph taken with a telephoto lens is by far the better shot. Had the other portrait been taken with a wide angle instead of the standard lens it would look even odder. A further reason for not using a wide angle lens is that such a lens sees more background—which you would have to accommodate. A long lens though, gives you more room for manoeuvre, and prevents the edges of the background creeping in at each side of the picture.

If you do not have a long enough room available, remember that you can shoot through an open doorway for the occasional full length picture. This has the added advantage that the doorway





acts as a very deep lens hood, cutting out any stray light.

A studio that is too long or wide is rarely a handicap, but a ceiling that is too high can cause problems. It is useful to have a fairly low, white painted ceiling, so that you can bounce light off it. Light bounced from a ceiling, like bounced flash, gives very pleasant, soft illumination but if the ceiling is higher than about four metres, bounced lighting effects become more or less impractical.

On the other hand, a very low ceiling may be restrictive—sometimes you may need to put a light above a model.

The ideal room to use as a studio, then, is at least five metres wide, nine metres long, and three to four metres high. A balcony is a useful feature, because it makes topshots—pictures from above—much easier to achieve. Natural light from two sides is an advantage, but not essential, and it is quite feasible to rely entirely on electric light.

Flash or tungsten?

One of the most important decisions facing a photographer setting up a studio is whether to use tungsten lights, or electronic flash. Both have their advantages: tungsten lights are cheaper to buy than studio flash units, but consume more electric power. Electronic flash freezes all action in the picture, but without Polaroid tests, it is difficult to see whether the lighting and exposure are correct. Tungsten lights give off more heat than electronic flash units, but are more reliable.

Perhaps the biggest factor is cost—

Equipment storage Even in a home studio, it is important to have all the essential accessories close at hand

studio flash units are too expensive to justify the outlay unless you use them very regularly. If you are working on a low budget, or have a lot to learn about lighting, it is probably better to buy tungsten units.

Tungsten lights are available in many forms. The cheapest are the type shown on pages 238 to 241, but these can only be used with quite low power photoflood bulbs. Although they are suitable for lighting at close quarters, the level of illumination from them drops considerably when they are moved back from the subject. This means that, unless you use a lot of lights, long exposures at quite large apertures are sometimes needed.

Professional photographers rarely use photoflood bulbs for tungsten lighting, instead, many prefer quartz-halogen lighting units. These take small glass tubes instead of bulbs, and usually have a power output of 1000 watts. Professional quartz lighting units are fairly expensive, but movie lights, which take the same lamps, are just as powerful and much cheaper. Check before you buy that the lights can be used for continuous running, and not just intermittently.

Quartz lights do not accept interchangeable reflectors, though some of them have a variable beam angle. Lighting effects must be controlled by using umbrellas, diffusers, or reflective sheets. Although this may seem more complicated than swapping from one

Useful equipment

Besides the basic fixtures and fittings for a studio, there is a whole range of small items that can be useful around the studio. Many are ordinary domestic tools or utensils, others are quite specialized. The list is not comprehensive and no single item is essential. However, all of the following items should help you get the best out of your studio and are all quite cheap.

Supporting, sticking and fixing: a general purpose tool kit comes in very handy for holding bits of a set or background together. Six house bricks can be used as supports or weights. A theatrical stage weight, or any heavy lump of metal is useful for similar purposes. A beer crate is good for standing on or to give a bit of extra height to a prop, and a laboratory retort stand can be used to support an object at any height or angle. Double-sided tape is invaluable for adjusting or fixing the position of props as is a plasticene type adhesive. Conventional tape, such as black PVC, or heavy carpet tape, has a thousand uses in the studio.

Lighting aids: reflectors of various sorts are essential. Large sheets of expanded polystyrene need very little support, and make excellent reflectors. Foil covered card, either high gloss or dull matt can be cut up and concealed in a still life to lighten shadows. Diffusers made of acrylic or tracing paper stretched on a frame, allow careful control of light. (Some diffusing material comes in a deep blue colour equivalent to an 80A filter, and converts tungsten light to daylight colour.) Black velvet stretched on a frame can be used to take light out of a portrait. Double-sided spring clips can be used instead of barn doors to 'flag' a light and prevent it shining into the lens. A *French flag* has a similar function but is attached to a tripod with a clamp.

Electrical leads and a long extension cable are essential, but tend to get snarled up. Store them in small fabric bags so that they are out of the way, but easily accessible. A peg board or a plastic rack such as those used for storing vegetables is useful for storing odd bits, but a wheeled trolley is better. Cover the shelves in ribbed rubber mat, so that lenses and other items do not roll around—a raised lip stops them falling off altogether.

For still life work, a dulling spray is very useful. This puts a fine matt lacquer on to shiny objects, so that they do not flare into the lens. A sheet of plate glass is a necessity if you photograph glassware, as it allows you to light from below.

Finally, do not neglect safety, particularly with hot tungsten lamps. Buy a fire extinguisher of the foam type—water is dangerous where there is electrical equipment in the room. A small step ladder is much safer to stand on than a wobbly chair or stool, and can double as a projector stand—but make sure all four legs are firmly on the ground.



Bold backgrounds
Seamless paper rolls come in many colours, but scraps of fabric are just as useful, and have more texture

Lighting aids
A French flag (fixed to the tripod) stops light shining into the lens, and black, silver and diffusion sheets help to control lighting

can easily use a bamboo pole, a couple of pulleys and a length of rope to raise and lower the paper.

For some purposes, paper rolls are unsuitable—some photographers feel they are featureless, bland, and lacking in character. If you want a background with some texture in it, lengths of fabric make a useful studio accessory. With a 135 mm lens, you only need a piece of fabric one metre square for a background to a head and shoulders portrait, and this sort of length can easily be bought as an 'end of roll remnant' at very low cost.

Wood, and plastic laminate panels make very good backgrounds, too, if you have enough room to store them.



Useful tools
All sorts of non-photographic items have a use in the studio

Plastic laminate wipes clean, and is waterproof and flexible. It is a good substitute for seamless background paper, and though the initial cost is higher, it can work out cheaper in the long run.

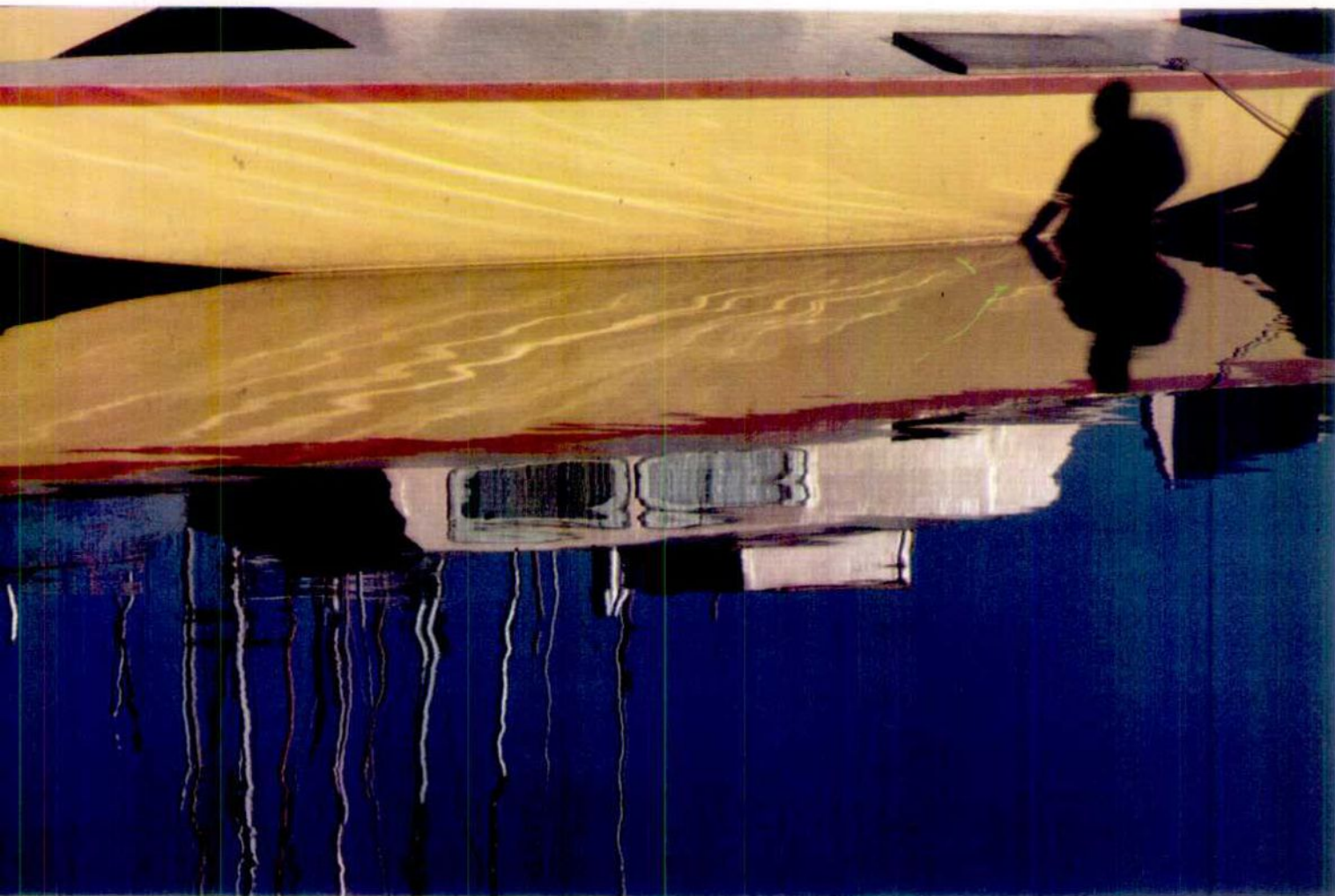
Whatever sort of background you use, it is convenient to be able to fix it to the floor, so that it does not move about in draughts or when someone walks past. If you have a wooden floor, this is a simple matter—you can staple it down, or put pins or nails through it. If your studio floor is solid concrete, however, it is well worth laying a plywood floor over at least part of the area of the studio. If you are using background paper in a studio which has fitted carpets, a temporary plywood floor cover becomes a necessity, because it prevents the paper being creased each time someone walks on it, or puts something down.

dished aluminium reflector to another, it can provide a more versatile method of lighting the subject. It also cuts down on cost—diffusers can be made cheaply and easily at home.

If you decide to use electronic flash, it is worth considering the purchase of a small monobloc studio flash unit. Unlike portable flashguns, these studio units have a modelling bulb close to the flash tube, and this gives you some indication of how the light changes when the model or the flash is moved. Portable flash guns are difficult to use in the studio, because you cannot see how light is falling on the subject—you are 'working in the dark'

Better backgrounds

Rolls of seamless background paper are ideal for portraits and many other types of photography. By concealing distracting details, they draw attention to the main subject and, with careful lighting, can make the join between the floor and wall of the studio invisible. Background rolls come in a wide range of colours, but if you buy a roll of white paper, you can use coloured gels over the lights to provide variations of hue. The paper is rolled in lengths of 11 or 25 metres and has a tubular cardboard core, by which it can be supported. Though special stands are available for this purpose, you



John de Visser



Creative approach

Reflections

Reflections can lend sparkle and surprise to otherwise ordinary pictures or may even be treated as the main subject of a composition

Reflections have always held a special fascination for photographers and it is not hard to see why. They are almost everywhere—increasingly so in the modern world. They possess a particular and unusual beauty, and present a view of the world around us ranging from the crystal clear to the distorted and abstract. Apart from this, photographing reflections needs no special equipment or technique—the secret of success lies mainly in the photographer's perception.

The starting point for taking pictures of reflected images, therefore, comes from educating your eyes to see them—you only have to look, though this may not be quite as simple as it seems as we are almost taught to ignore reflections in daily life. We look straight through reflective transparent materials, or concentrate on the form of opaque reflective materials, filtering out the reflections on their surfaces so that they are hardly noticed. Even in photography reflections are usually avoided because of their

confusing effect on the subject image, and many photographers fit filters to their cameras to help eliminate or reduce them, never pausing to consider the potential of reflections as subject material in their own right.

Different types of reflective materials, such as mirrors, glass, shiny metals and water produce different types of reflected images. But the quality of the light is just as important a factor as the reflective material itself. Good clear light results in reflections of a similar nature. And as the lighting changes so too will the appearance of the reflected image. This is well worth bearing in mind as you may be able to get several quite different shots of the same subject by waiting for the lighting conditions to change, or varying them deliberately.

Mirrors are, perhaps, the most obvious source of reflections, and an ordinary domestic mirror provides a convenient starting point for practice.

Remember that the real distance

between camera and subject is increased by a mirror, and, at wide aperture settings, you will need to focus on the reflected image on the surface of the mirror if you want the reflection to appear sharp. However, many successful pictures are taken in which the mirror surround is sharp, but the reflection is slightly out of focus, giving an abstract, impressionistic quality to the subject. With a narrow aperture, it is possible to ensure that both the mirror and the reflection are in sharp focus. This offers the possibility of misleading the viewer, who will miss the sense of depth available in real life. Perhaps the best way to begin is to experiment with all these possibilities until you decide which you prefer to concentrate on.

Mirrors, by their nature, form a frame around your subject, and are clearly useful for portraiture for this reason. By posing your sitters formally and photographing them as a reflection, you can achieve the illusion of a portrait hanging



Tower blocks Glass clad buildings make good reflective surfaces. Here a wide angle transforms verticals into curves

Boat The brightest reflections show up when the reflecting surface is in shadow and the subject is strongly lit

Nightclub A display poster in a window seems to be superimposed on neon signs reflected from the streets

on the wall, perhaps alongside other pictures. Alternatively, you can use an angled mirror to reflect another view of your sitter, so that, for instance, both full face and profile are shown in the same shot. This technique can also be used when photographing the interiors of buildings, either to show a part of the room which is not covered by the camera's angle of view, or even to show another room. By using more than one

mirror, you can create multiple images of your subject. Dressing table mirrors, for example, often have side flaps which can be angled to reflect the subject from practically every aspect. You could use the multiple image to suggest the intricacies of a human personality. In a similar way, a picture of your subject reflected in broken pieces of mirror could suggest a fragmentation or breakdown of this personality.

Remember that the scale of the mirror relative to the framing of the picture can also be varied. Used full-frame, a mirror image is no different from a direct shot of the subject; used smaller the reflection can be a useful complement to the overall composition and theme.

A display of mirrors in a shop window can be used to reflect passers by—an interesting way of taking candid studies. A street mirror can be used in the same way for unusual views of street life—perhaps when you do not want people to be faced directly with your camera. Small magnifying mirrors and drifting mirrors can also be used for interesting views and studies of subjects.

However, you may decide that the clarity of mirror images is just a little too straightforward and if you want a more abstract or impressionistic quality from your pictures it is worth looking for more unusual sources of reflections.

Polished metals, such as chrome, silver or brass are excellent for this type of reflection, especially if curved surfaces



are involved as these produce distorted images. Most car hub caps, for instance, are convex and create ultra-wide angle distortions, similar to the effect given by a fish eye lens. This type of reflection can be used to give a new slant to a much photographed subject—a famous building for instance. Smaller objects, such as polished steel salt cellars, knives and ornaments also give interesting reflections and, with some thought, can be worked into many compositions.

If you want to show accurate colour in a reflection from metal, choose silver coloured metals. Reflections from coloured metals such as copper and brass are less distinct and more difficult to pick out in the final picture, but may be worth photographing nonetheless. Try getting in close to photograph instruments in a brass band, for instance.

By focusing on one instrument, you can catch the reflections of other players. Copper saucepans and brass tabletops sometimes found in bars can be used to reflect their surroundings. Since the reflections in these cases will not be very clear, you should try to render the subject as just a part of a wider, carefully thought out, composition. Whatever the metal, you will be more successful if it is clean, and if the subject of the reflection is adequately lit.

Glass, because of its transparent quality, allows partial as well as total reflection, depending on the direction of the light source and your own viewpoint. You may be able to see a misty reflection of something on the surface of the glass and yet still see through clearly enough to a subject behind it. Pictures of an exciting multi-dimensional



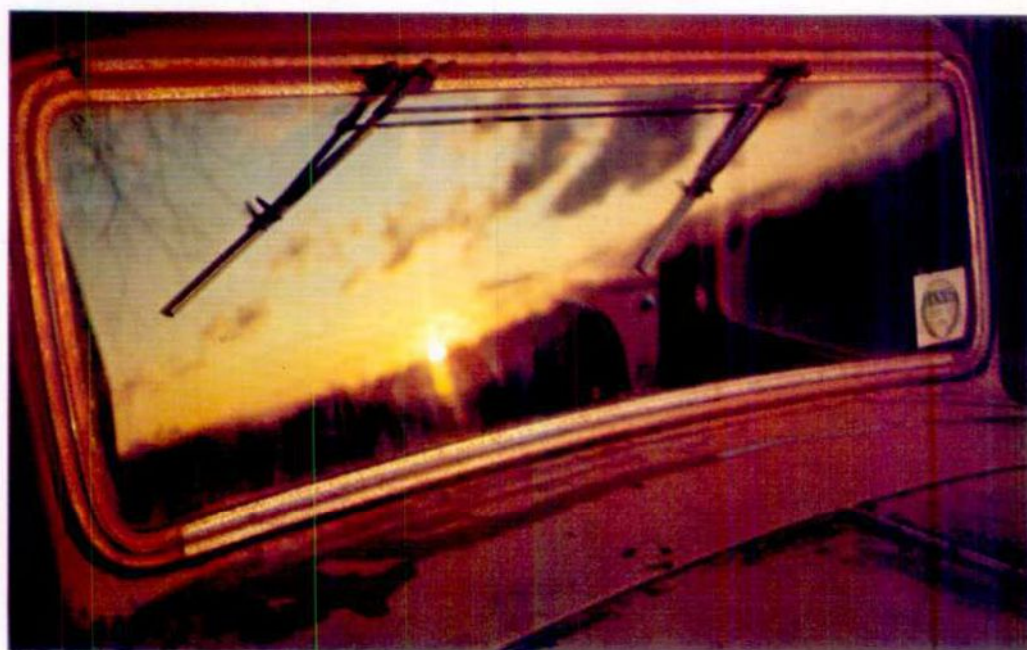
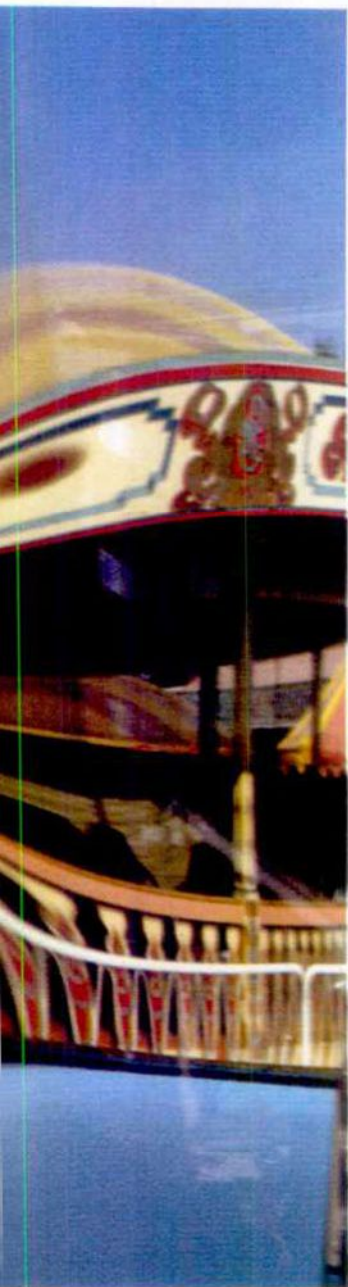
Colin Molyneux



Robin Bath



Sergio Dorantes



Trevor Wood



Bob Croxford

Seashore Even a thin film of water is enough to give a reflected image which, in this shot, is broken up by patterns in the sand.

Fairground Curved metal surfaces, such as car bodies, produce vivid, clear but distorted reflections which make excellent pictures.

Front foot Small panels of convex glass reveal tiny individual wide angle reflections of a scene.

Sunset Careful positioning of the car, combined with an accurate exposure, shows a sunset with a difference.

Palms Giving equal weight to the subject and its reflection, keeps the image symmetrical. Here, the touch of blue adds an accent of colour

Creative approach

quality can be created in this way. However, it is easy to produce a messy or confused image when dealing with several visual layers at the same time, so take a little time to consider variations on the composition of the subjects that you see. Partial reflections need a good level of illumination on both sides of the glass. If you are photographing shop windows, for instance, it will be quite difficult not to record the reflections of the street outside the shop. By combining the right subjects, you can produce interesting, even unlikely, contrasts. A car could appear to be driving into a china shop, for instance. Alternatively, use your windows at home to superimpose outdoor elements on to those indoors. A study of a face at a window can be enhanced by partial reflections of trees, buildings, people in the street, or simply a cloudy sky. Windows of restaurants or cafés are ideal for this type of portrait. The same method can be used very successfully with car windows. Think of the films you have seen where the cameraman has used reflections of the sky, or surrounding trees to add interest to shots of the

Rocky Mountains *The still waters of a lake produce a mirror image which can transform an ordinary mountainscape*

Actor *Mirrors are obvious sources of reflections, so try to find subjects which are colourful and interesting*

John de Visser



Robert Macfarlane/Susan Griggs Agency

driver and passengers. By positioning a car carefully, you can achieve the same effect, perhaps to record a scenic view in a less conventional manner.

Reflective sunglasses can be used in the same way, to combine a portrait with a landscape. An unusual holiday picture can result from this, when a pair of sunglasses have been left on a beach towel, and people swimming in the sea are reflected in the glasses. If you only have ordinary sunglasses, you can still take such pictures if they are in the shade, reflecting brighter surroundings.

Architectural photography can be

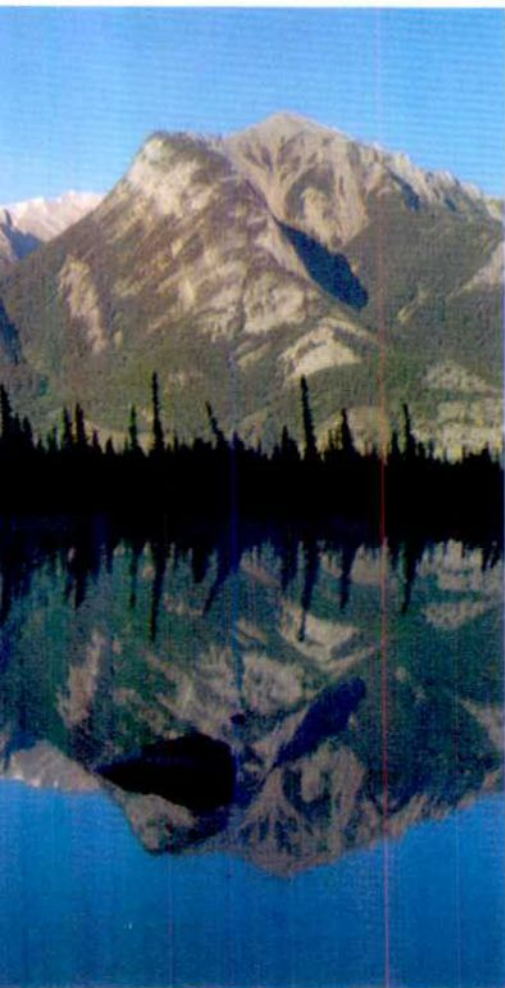
enhanced by reflections in many cases, particularly modern glass-clad buildings. Architects often use the reflective properties of glass deliberately, to give their buildings a feeling of airy lightness as they reflect the sky and surrounding buildings. A successful picture can be made of these reflections, especially when the building reflected is of an older style. For a really dramatic shot, wait for the golden reflections of early morning or late afternoon, or better still, the moment just before dusk when the lights inside the building have been switched on, but there is still enough

light in the sky to create reflections on the outside surfaces of the windows.

Very often, the type of glass can modify the reflection itself. Old panes of glass, for instance, imperfect and irregular, produce diverse and distorted patterns and textures which you can use in an abstract composition. Parallel panes of glass, when viewed from the right angle, can produce reflected images that repeat themselves infinitely. In order to see this, find a spot where there is a window both in front of, and behind, your subject, but be careful to keep your camera out of view.

Like glass, water relies on reflections to give it colour and substance. But water differs from glass in that its surface is not always smooth—a quality that can be exploited in photography. You may be familiar with the traditional scenic shot of mountains, hills or trees reflected in the still water of a lake. Take your first pictures of this type of view when the water is still, but then disturb the surface a little, and watch the reflections assume different forms. Try varying your viewpoint, so that some of your pictures include both subject and reflection, while others concentrate on the reflection itself. You can use a fast shutter speed to freeze the image, or use a slow one to retain the blurred, rippling effect.

Alternatively look for brightly coloured reflections, fishing boats in a harbour, for instance. Splashes of bright colours work well against the blue-grey of the water. Bright sunlight can add sparkle to your



Ripples Water that is slightly disturbed produces impressionistic, and sometimes abstract, reflections

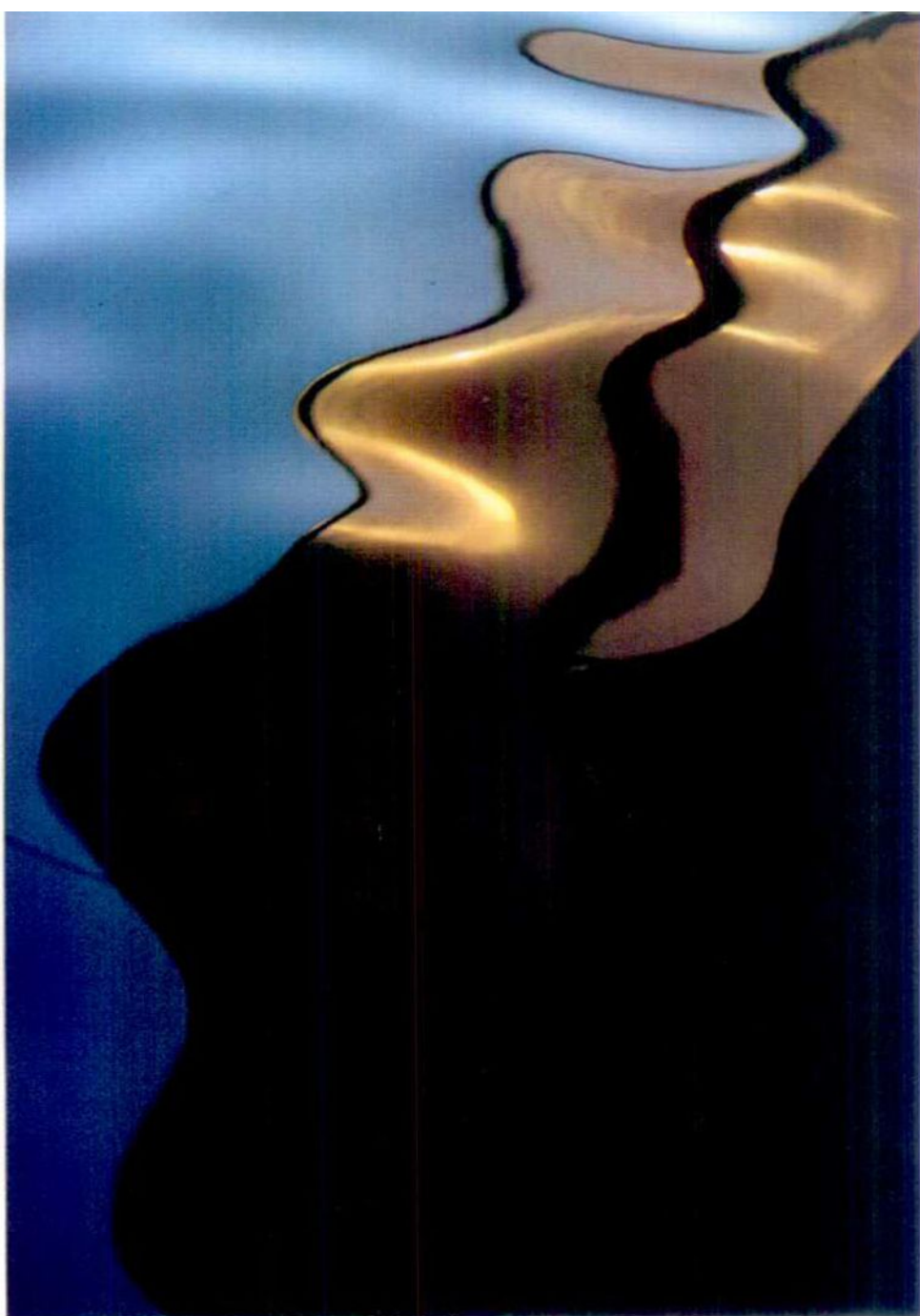
Cake shop In order to show this type of reflection clearly you need good light on both sides of the glass

pictures and any expanse of water can be changed from a neutral expanse into a golden shimmer simply by shooting into the light. Here again, the best times to choose are the early morning and late afternoon.

You do not have to travel to the nearest lake, canal or pond to find a reflection in water. After rain, even shallow puddles can transform roads and walkways into a mass of shimmering reflections. Even puddles outside your house door are worth investigating for potential photographs.

At night, reflections on water or in glass, especially in brightly lit city areas, can be even more dramatic. Car lights, street lights, shop window illuminations and neon signs splash bright impressionistic coloured reflections across the otherwise dark streets.

Finally, remember that most pictures work better if the images are clean and simple. Adding reflections to a composition is likely to complicate it, so try to make the centre of interest of your picture either obvious or well-defined. Then the magic of the reflection will gain in impact, and your photograph will be more successful as a result.



Anne Conway



Tapdance

Lens sharpness

Assessments of lens quality tend to be rather vague. But there are aspects of lens performance which can be studied objectively by means of various tests



graphers test their lenses for resolving power by using a special test chart and slow film. The chart consists of groups of black lines on a white ground, the spaces between the lines being equal in width to the lines themselves.

A lens is judged by how many lines per millimetre it can resolve. For this reason, the test charts contain lines of various separations. The film used when making lens tests should have a performance which is better than that of the lens itself, or the results will not be meaningful.

At the limit of a lens's performance, some deterioration in quality is inevitable. Oddly enough, the various criteria of performance do not go hand in hand. A lens with good resolving power will not necessarily give an image that looks critically sharp. Even a picture which shows excellent reproduction of fine details may not have the 'crisp' appearance nor-

Soft focus Some lenses are deliberately made 'soft' in order to produce special pictorial effects

Pincushion distortion Even a sharp lens may suffer from distortion, which makes it unsuitable for some subjects

Photographers often talk about a particular lens as being 'good' or 'poor'. But defining exactly what these terms mean is not easy. Opinions about a specific item often differ. So it is useful to be able to identify aspects which can be studied objectively.

Important terms involved when discussing lens quality are *sharpness*, *resolution* and *definition*. The actual means of testing are dealt with in subsequent articles. But first it is useful to see exactly what is meant by them.

Lens performance

Early astronomers tested new telescope lenses by looking at known double stars to see if both were visible as separate points—that is, if they were *resolved*. A lens with good resolving power, then, is one which is capable of showing fine details clearly. Many people regard good resolving power as being the primary requirement of a lens. And indeed some photo-





Television image This is a case of the image looking 'sharp' but having poor resolution of detail

mally associated with sharpness. It is equally possible for a photograph to appear very sharp when the reproduction of detail is actually very coarse. A good example of the latter is a correctly adjusted television set showing a studio transmission. The image may look crisply sharp, but its resolving power is very poor.

There is a problem in that the term 'sharpness' does not have a fixed meaning. Different people use it in different ways. But there is one aspect, concerned with contrast, which is largely responsible for producing sharp looking images.

It is possible to use a lens test chart to illustrate this aspect of sharpness. A lens with good resolving power shows the lines of the chart as separate lines in the image. But the edges of the lines may not be particularly clear. Instead of a distinct border between the black line and the white space, the image consists of an area where one fades into the other.

With an image which is 'sharp', however, the contrast between the lines and spaces is more abrupt—the edges of the lines are more clearly defined. However, some lines merge into others, giving lower resolution.

Sharpness is largely subjective. But it can be represented in terms of *acutance*. Measuring this involves plotting a graph showing density against distance for a 'knife-edge', which is reproduced on the film. This is a highly technical procedure. But a good indication of sharpness can be gained by applying a

similar principle to the image of a line from a test chart.

Values are plotted for the black line, the white space, and points in between. The resulting graph will include a slope showing the gradual fall-off in density at the edge of the line. This slope can be represented by its gradient, which is known as the *edge gradient*. The steeper the gradient, the sharper the image appears. This result shows the sharpness of the lens-film combination. To study the sharpness of the lens alone it is necessary to examine the actual image projected by it. This is not usually done because the results would not be particularly informative. As with other aspects of lens quality, it is how the lens performs under normal conditions of use which is important. The type of film and method of development contribute significantly to the impression of sharpness since they can affect the contrast of the resulting photograph.

Definition

Another term, often used instead of sharpness, is *definition*. To be more precise, this usually means the combination of sharpness and resolution. A lens which can resolve reasonably fine detail and give good edge sharpness is said to have good definition.

With most lenses, sharpness and good resolving power go together. But the lens designer may decide to favour one of them. In addition, some lenses give better resolution with low contrast subjects, and some with high contrast ones. So these aspects of lens performance help to give a lens its individual characteristics.

The limits to resolving power and sharpness are often set by the residual aberrations of the lens (see page 906), so that stopping down can give better results. Lenses are classed as *aberration limited* or, if they are almost free of aberrations, *diffraction limited*.

With a diffraction limited lens, the best definition is at full aperture, when the effects of diffraction (which produces progressively unsharp images as the lens is stopped down) are at a minimum. But with an aberration limited lens, definition is better with the lens stopped down slightly, to reduce spherical and chromatic aberrations. Furthermore the resolution tends to deteriorate towards the edges of the field. Stopping down helps in this respect.

If the lens is stopped down too far, so that the light passes through a rather small

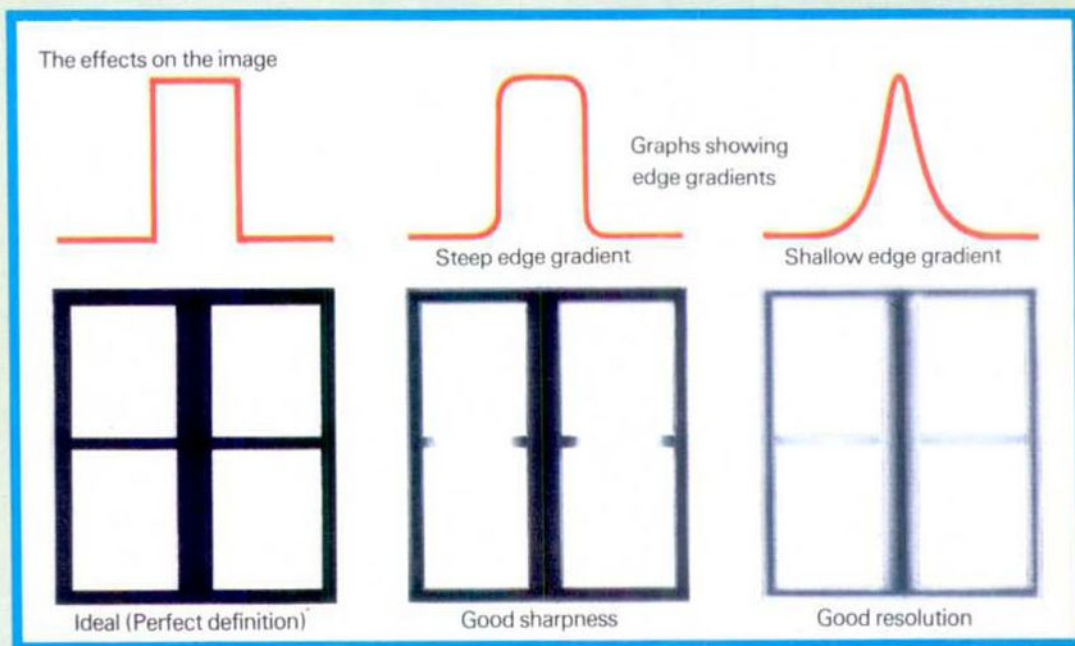
aperture, diffraction cancels out the benefit gained by having less spherical and chromatic aberrations. There is an optimum aperture which produces the best compromise. But this may not be the same for the edges of the field as for the centre. So for the best overall result, the lens is stopped down slightly further—say another half stop—to improve the detail at the edge of the frame.

Even if the lens is free from those aberrations which affect definition, it may suffer from distortion. Such a lens can produce images which are very sharp and full of fine detail. But its use is restricted because it tends to distort straight lines.

At the other extreme, some portrait lenses deliberately sacrifice definition in order to produce a soft focus effect. They do this by not correcting for some of the spherical aberration produced by the basic lens design. Both these examples show that sharpness and resolution are not necessarily the only criteria for judging a lens. The quality or value of a lens can only be determined by looking at what it is needed for, and how it is likely to be used.

Sharpness and resolution

Fine detail (represented by lines on a test chart) can be affected in different ways by a lens. It can have clearly visible edges—good edge sharpness—without the separate details being resolved. Or, all the details may be resolved without the image looking very sharp





Push processing B&W

The speed of your film is often a severe restriction on your picture taking capabilities. But you can push film speed either by increasing development times or by using special developers



Barry Lewis/Network

The problem is a common one: you look through the viewfinder of your camera and find that, even with your lens aperture wide open, you cannot set a shutter speed fast enough for a handheld photograph. There simply is not enough light.

There are many solutions to the problem, most of which call for extra equipment and have attendant disadvantages. You can add extra light with a flashgun—and quite possibly destroy the visual mood that you want to capture. You can fit a faster lens—if you can afford one. You can put your camera on a tripod—and hope that your subject holds still. Or you can use a faster film—if you are not already using the fastest film you can find.

This last course is probably the best since it calls for no extra bulky equipment, yet leaves you mobile and relatively inconspicuous. For this reason, 400 ASA (ISO) black and white film is regarded as standard by most press photographers and others who want to take pictures in poor or unpredictable lighting.

But when the light is too dim even for

400 ASA film, there is still one more thing that can be done: you can increase the ASA number of the film and compensate later by changing the development you give the film.

Pushing

When film is given different development to increase its effective speed this is known as *push processing* or, more simply, *pushing*. Like other methods of taking photographs in poor light, pushing has some disadvantages, but quite often these are outweighed by the benefits.

There is nothing sacred about film speed and ASA numbers. They are no more than indications of the sensitivity of films under certain standardized circumstances. The ASA numbers of black and white films are established by the makers who process test rolls in a standard developer and compare the results with a standard degree of development that has been found to give prints that are acceptable to most people. This system has certain disadvantages. In the first place, many people do not actually use the film

Way out landscape For something just a little out of the ordinary, try push processing films used in full daylight

maker's recommended 'standard' developer for normal photography. And in the second place, the picture quality that others may find acceptable may not be quite what you want for your photographs. By taking advantage of the different types of developer that are available, and by carefully deciding at what level to 'peg' the quality of your photographs, you may find that you can expose your black and white films at ratings which are appreciably higher than the quoted ASA numbers.

Generally, however, pushing film has certain disadvantages. The very best image quality can be obtained only by using the slowest film possible, and this must be developed correctly after exposure. Faster films are generally grainier and less sharp than slow ones, and pushing only makes graininess worse. In theory, sharpness also suffers when film is pushed, but in practice you may find that the higher shutter speeds

Exposed at 400 ASA



A complete length of Ilford HP5 film was exposed at a nominal rating of 400 ASA and sections of this were developed in different developers or for different times. Development time in ID-11 diluted 1+1 is normally 12 minutes. But for this shot, 18 minutes proved better. The neg (top) has more contrast than with normal development. The densest negative (Paterson Acuspeed, lower) is acceptable

BEST/WORST NEG



12 → 12A



37 → 37A

Exposed at 1600 ASA



Another roll of HP5 was exposed at 1600 ASA and sections of this were processed in ordinary and speed increasing developers. The most satisfactory print was obtained from film developed in Baumann Diafine (top) although comparable quality was obtained by using Paterson Acuspeed. About the only really unprintable negative (lower) came from film which received the ordinary 12 minute ID-11 (1 + 1) development

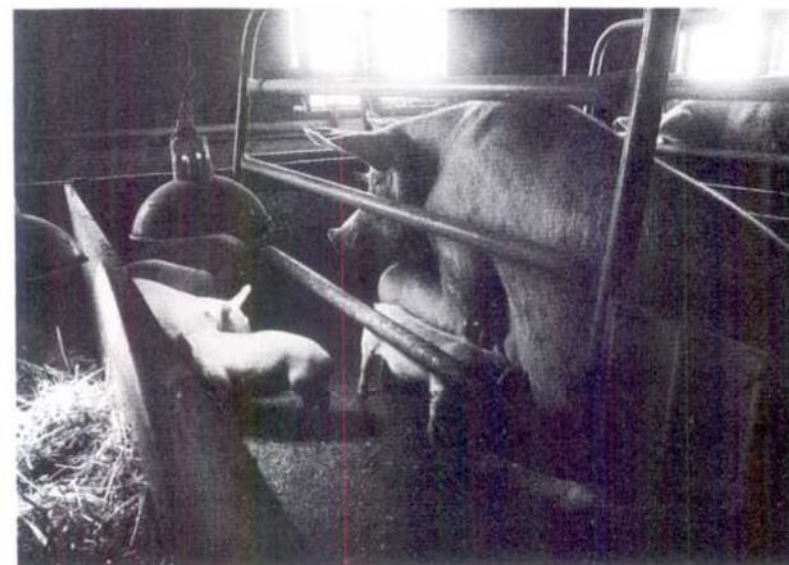
BEST/WORST NEG



33 → 33A



Exposed at 6400 ASA



This is a really testing lighting situation where available light photography poses immense difficulties. HP5 was exposed at a nominal rating of 6400 ASA. Baumann Acufine yielded by far the best negative (top) in the printing used for these tests. Images from Paterson Acuspeed (normal time) and diluted ID-11 push processed for 24 minutes could be of some use, but negatives are very thin and require careful printing

BEST/WORST NEG



33 → 33A



6 → 6A

XP1 and HP5 compared



XP1 exposed at 400 ASA

HP5 processed in ID-11 for 12 mins.



To compare the performance of Ilford XP1 and pushed HP5, we took these three pairs of pictures. For each pair, both films were given the same exposure, but



XP1 exposed at 1600 ASA

HP5 processed in ID-11 for 24 mins.



while the process time for the HP5 was extended to suit the rate at which it was exposed, all the XP1 was given the standard 1600 ASA time. At 400 ASA, XP1



XP1 exposed at 6400 ASA

HP5 processed in Acuspeed



gives good contrast but 'mushy' grain; at 1600 ASA, it gives slightly better highlight detail than HP5; at 6400 ASA, however—in very low light—XP1 is much weaker

and smaller apertures obtained with uprated film enables you to take pictures which appear to be sharper. But one significant disadvantage of pushing is that shadow detail is reduced. This gives pictures with flat areas of empty dark tone where, in the original you may have been able to see detail.

Extended development

The easiest way to extract more speed from black and white film is simply to develop it for longer. Although this has the effect of increasing the image contrast of the negatives, it does not normally pose too many difficulties at the printing stage, providing you avoid very long development times. When printing an underexposed but normally developed negative, most photographers encounter two problems. First, the negative is very thin, and calls for very short printing exposures. Second, it is usually difficult to make the deepest shadows print as rich blacks without affecting the balance of the important mid tones in the picture. A remedy is to print on a harder than normal grade of paper. This can be expensive if you have to buy a box of paper for just a film or two—and there is always the possibility that a hard enough grade for your needs does not exist, or is not readily available. But increasing negative contrast by extending development times enables you to print underexposed negatives with good dark tones on normal grades of paper.

Increased development also means much greater graininess, loss of highlight detail due to higher contrast, and a third problem—raised fog level. Just

because a pushed negative looks as if it has about the same overall density as a normally exposed and developed negative, this does not mean that it actually has as much printable photographic information recorded on it. When film is left in developer long enough, even the unexposed silver halides in the film emulsion begin to be developed. This produces what is called *development fog* in the shadow areas.

Fog can mislead you into thinking that you have recorded more detail than is the case, as well as being bad for your pictures. The main problem with pushing film is preserving the separation of tones corresponding to the shadow detail of the object. Lengthy development can cause such an increase in the fog level that the fog literally swamps the slight tonal separations that you are most anxious to keep. But as long as the development is not pushed too much, the gain in contrast will more than offset the fog effect, and details will be visible in the shadow areas.

So development time cannot be extended indefinitely to give higher film speeds. However, extended development is a simple, easy technique and is worth using when you only need a moderate increase in speed. The degree of extra development needed depends on the film and developer you customarily use, but as a guide, if you double your film speed you need to give 50 per cent extra development. Thus a 400 ASA film that normally requires eight minutes development should be given 12 minutes development if it is exposed at a rating of 800 ASA.

Special developers

If you often have the need to rate your film at higher than its specified ASA rating, then you should investigate the potential of specially made speed increasing developers. These are usually compensating type developers which work less strongly on the fully exposed highlights of the negative than on the shadow areas. This means that they give shadows a lift while leaving highlights less affected. Because of this, compensating developers are useful when you are photographing subjects that are lit by dim but contrasty lighting. Not only do they improve shadow detail, they also retain the separation of highlight tones that are easily lost when pushing development in a normal developer.

Many developers are available that claim to produce an increase in film speed. Acuspeed, Diafine, Emofin, Microphen and many others all have their supporters. Most are used in much the same way as normal developers which provide little or no speed increase, but some—such as Diafine and Emofin—are particularly interesting since they are two-bath developers offering very high film speed ratings.

In these, the components of the developer are divided into two solutions. The first solution contains a slow working developing agent. The second solution contains an alkali.

When film is soaked in the first solution, very little happens. After the film has had long enough to absorb sufficient developing agent into the emulsion, the first solution is poured out of the developing tank and the second

solution is poured in. The activator immediately makes the developing agent start to work.

The first solution is formulated in such a way that the concentration of developing agent soaked into the emulsion is just sufficient to develop the negative highlights. So when the activator comes into contact with the film, the developer in the highlights—the dense, fully exposed parts of the image of a negative—is quickly exhausted whereas development continues in the shadow areas. The result is a considerable boost in the effective film speed and a reduction in contrast.

In addition, two-bath developers are particularly easy to use since the degree of development they give to film is governed primarily by the concentration of the first solution rather than by time or temperature. As long as the temperature and time are approximately correct, the film will be properly developed.

Chromogenic films

Although very high speed films have been available for some time, these have in the past been very grainy conventional type films such as Kodak 2475 Recording film and Kodak Royal-X. These can be processed in much the same way as ordinary high speed films.

Lately, however, the new chromogenic films such as Ilford XP1 and Agfa Vario-XL have become popular with photographers seeking more speed. Their manufacturers claim that these films give satisfactory results at any speed rating from 125 to 1600 ASA.

With such a considerable reserve of speed, there is little point in push processing the film, and Agfa give no recommendations for pushing Vario-XL. Ilford, on the other hand, do give

extended processing recommendations for use when their XP1 film has been exposed at 800 ASA or 1600 ASA. At its standard processing temperature of 38°C, XP1 should be developed for 6½ minutes at 800 ASA or for 9 minutes at 1600 ASA.

This has advantages, since it enables an image to be produced that can be more easily printed, but it is not without its disadvantages. XP1 is designed to give optimum results at 400 ASA, at which speed it behaves like a very sharp, fine grain film with unusually high speed. The emphasis of XP1 is on image quality rather than speed, and pushing this film tends to defeat its designed purpose. For this reason, Ilford suggest that for maximum speed you should use their conventional HP5 film developed in Microphen.

There is no recommended method for pushing Vario-XL. However, if you wish to experiment with increased development of this film, try giving a five minute development time instead of the recommended 3½ minute time in C41 chemicals. This should give about a one stop increase in film speed.

Making your own tests

If you intend to do a great deal of low light photography, it will be worthwhile making a series of tests to establish an accurate set of times for push processing, even if so-called speed increasing developers are used. These tests are straightforward, but you must take all the usual precautions to make sure that the processing conditions remain identical if results are always going to hold true.

The tests involve photographing the same subject at a range of exposures corresponding to different film speeds. This is done on several strips of film,

which are then push processed at different times.

Choose an even-toned subject such as a specially arranged still life or test target, and make exposures corresponding to a range of different ASA values. For 400 ASA film, start with a 200 ASA exposure, and progressively double this on each subsequent exposure so a range of, say, up to 6400 ASA is covered. Take careful note of your sequence of exposures so a particular ASA rating can easily be traced after processing. The ideal way to do this is to include a note of the rated speed in each frame.

Your camera meter may not operate at the higher end of the ASA speeds range, but it is a simple matter to continue halving the exposure once the limit is reached.

Repeat the series of exposures several times so you have enough strips of film for testing a range of development times, but these have to be 'split'—in darkness—before processing. You should be able to get at least two tests on each film so you have enough strips for testing a range of development times.

If you are being really thorough, the range of times should start with the development time you use for the normal 400 ASA rating—you can use this test to check whether your equipment, technique and methods of photography match the 'normal' rating. A better quality image at other than the 400 ASA exposure would suggest otherwise.

You can then use the remaining strips to gauge the effects of increasing the development time beyond the normal. If the film or developer maker gives suggestions for push processing, use these as a basis for your own experiments. Otherwise, set yourself a range of increases—say, an extra 25 per cent, 50 per cent, 75 per cent, 100 per cent, and so on—and progressively work through these until it is clear that the resulting quality of the image is no longer of use to you.

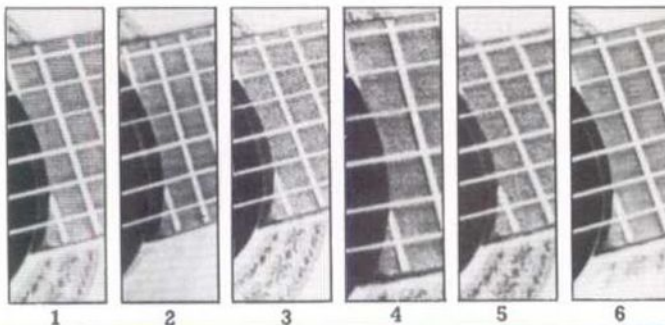
The test sequence can be repeated for any other film and developer combination but there is little point trying to push process films slower than 400 ASA for anything other than a rescue operation of a whole film length known to be underexposed.

If speed-increasing developers are push processed much beyond their 'normal' development times, you risk a rapid build up in the fog level. Nevertheless, you may find it an interesting experiment to conduct a test sequence using these special developers. The range of effective ASA values could then be increased considerably beyond the 6400 ASA mark used for standard type developers, but you will notice a rapid fall off in quality before these levels are reached.

You can establish which is the most effective ASA rating for a particular development time effectively only by printing your images. The ASA value which yields the most satisfactory print image can be checked from your notes.

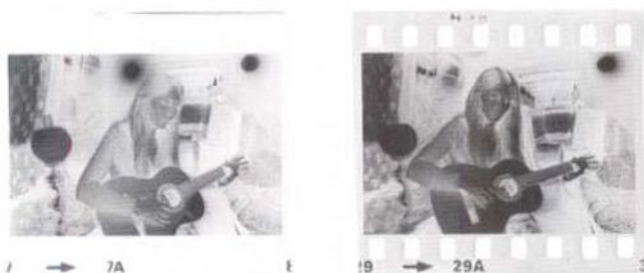
How grain size increases

Fog level goes up with film speed as well as grain size. HP5 has much less fog when processed normally (right) than when push processed (far right)



Fog level changes

Sections of ×12 prints from HP5 exposed at 400 ASA and developed thus:
1 ID-11 (1+1): 12 mins.
2 18 mins.
3 24 mins.
4 Acuspeed.
5 Diafine.
6 XP1 processed for 1600 ASA





World of photography

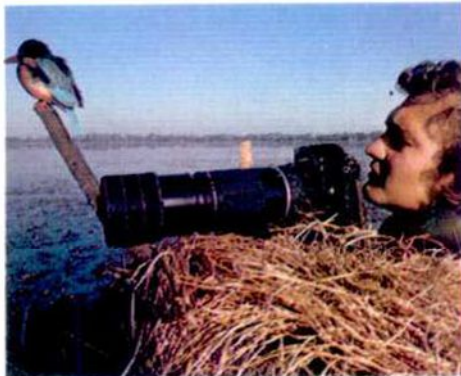
Jean-Paul Ferrero

One of the youngest wildlife photographers working today to have achieved a worldwide reputation, Jean-Paul Ferrero travels the globe photographing the subjects he loves best

It is late afternoon in the depths of the Bharatpur Wild Life Sanctuary in northern India and some of the rarest birds in the world are settling down to feed in a great shallow lake in the heart of the sanctuary. High up in one of the trees is a young man, gazing intently through the lens of a camera supported on a sturdy tripod wedged into the branches of the tree. He has been sitting there for a considerable time and seems to be settled in for a long wait, blending in with the countryside that surrounds him.

The young man is Jean-Paul Ferrero and he is waiting for a chance to take pictures of the Siberian white crane—one of the rarest birds in the world. Every year about 30 of these birds winter at Bharatpur and this small group comprises about a fifth of the total world population of this rare bird.

To most photographers, even specialist wildlife photographers, climbing the tree with a camera and long lens would have been effort enough. Like Ferrero they would have picked the spot carefully and decided on the right time of day



Jean-Paul Ferrero will sit for hours on end in hides in order to achieve the best results possible

to take the pictures. Then having climbed their chosen tree they would have positioned themselves with their camera wedged against the tree trunk.

It is the extra element that marks out Ferrero's approach to his art. He has gone to the lengths of hauling a large unwieldy tripod into the tree with him to

make absolutely sure that in taking his pictures he has as much flexibility as is humanly possible. If an opportunity occurs to capture a good picture he has made sure that he is absolutely prepared for it and in the pursuit of this end he will go to almost any lengths.

Ferrero's determination to succeed in his chosen profession as a wildlife photographer is matched by his love for the wildlife that he photographs.

These two major elements have made Ferrero one of the most outstanding young wildlife photographers in the world today. He sells his stories to major wildlife magazines and has been on several assignments for the geographical magazine, *GEO*. In addition, his pictures have been used as illustrations in a large number of books and magazines throughout the world.

Ferrero's involvement in photography came about through an early interest in

Freedom of the range Thoroughbred horses photographed late one afternoon in western New South Wales, Australia





Kangaroos Picked out by the sunlight this group of red kangaroos were photographed during a six month project

animals: 'I was studying to become an animal behaviourist . . . I wanted to travel around to study animals in the field. So I thought the short way to do it was to take pictures of animals'.

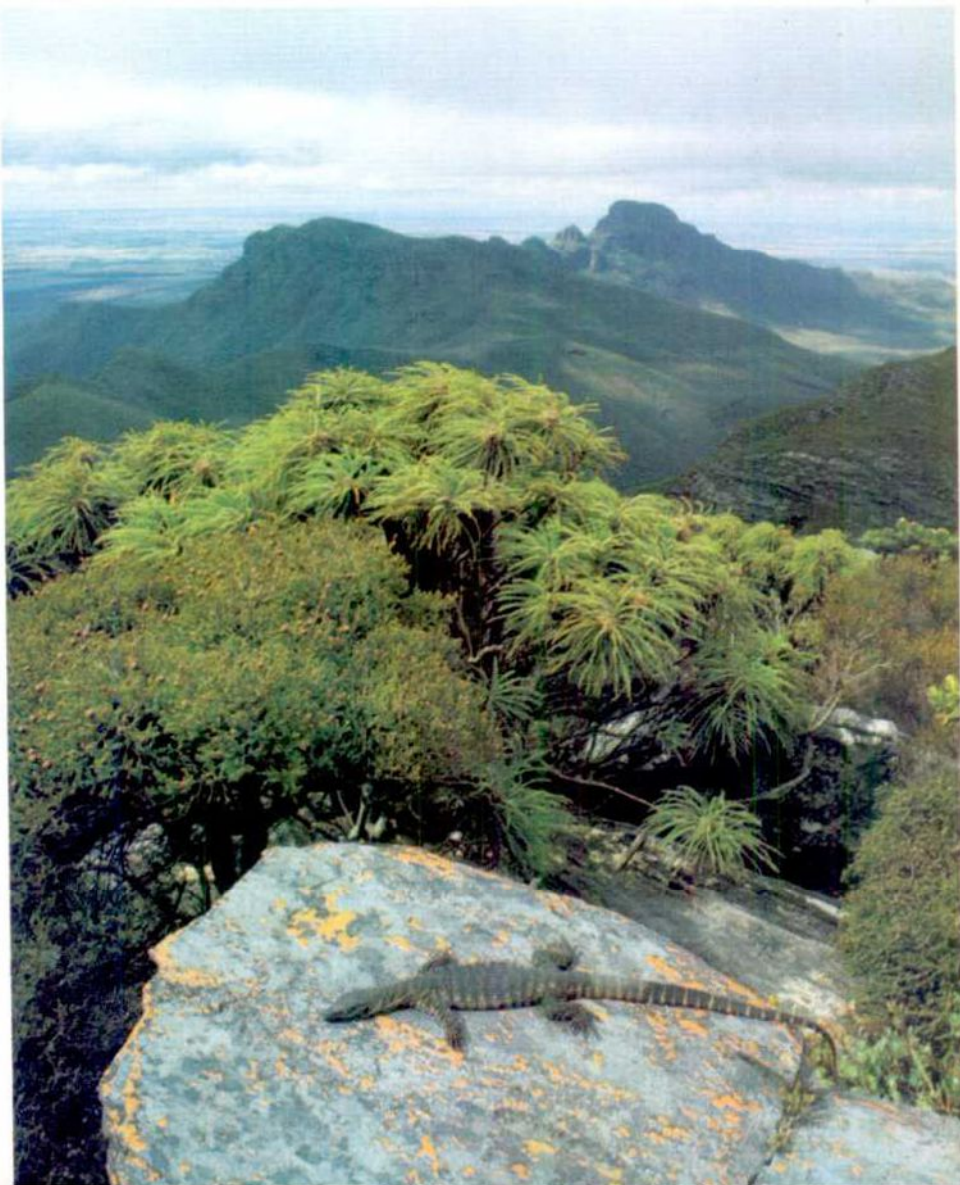
He began by photographing pets, sold some of his pictures to magazines and then left his native France for Australia, where he hitchhiked around for three months with very little equipment and even less money.

His reasons for choosing Australia for his first self-assigned project are very clear, and were strongly influenced by the fact that as a beginner in the field he needed to find an area in the world which other wildlife photographers had not covered in any great depth. 'When I began in 1973 I had to discover a very new field for wildlife photography . . . it had to be either South America or Australia. I chose Australia because I was more interested in it.' He had been thinking about the country since he was a child: 'I was always very attracted to the wildlife . . . they have all these weird animals there like marsupials, and lots of snakes, frogs and lizards.'

Recently this early interest has increased and he is now planning to concentrate all his energies in Australia, New Guinea and New Zealand.

Ferrero's dedication is amply demon-

Varanus rosenbergi A rare lizard taken on Bluff Knoll in the middle of the Stirling Ranges in Australia





strated by the six months he spent in Australia exclusively photographing kangaroos: 'If you want to do something well then you have to spend your whole time on it... you have to do it and not think about anything else. When I photographed kangaroos, I intended to have the best pictures of them ever taken. I think I succeeded. It took me a lot of time but it was worth it. That's the only way you get recognized and get work. If you do bits and pieces of everything it's just a waste of time in terms of business and a job.'

It is not always possible for Ferrero to find the financial backing for his long-term projects. Instead, he manages to earn a living by doing shorter assignments. After working for a number of French magazines he started doing assignments for *GEO* in the late 70s. These have ranged from a news story on the reintroduction of the barbary ape into Morocco to more extended essays like the one he recently did on horses, covering the stud farms of France.

Like many other professional photographers he is keen to point out how little of his time is actually spent on the assignment itself. 'I only spend about 50 per cent of my time actually taking pictures. The other half will be spent making notes, captions, looking through my files, sending invoices and on administrative work generally. I would love to get rid of all that stuff—I would love to spend 24 hours a day taking pictures of wildlife, but it's just not possible. I have to pay the rent.'

Ferrero's projects and assignments also help to build up his picture library, from which he now earns around 40 per cent of his income. He operates the library jointly with his agents in Paris and London. 'Basically, I'd like to get more interesting assignments and to get rid of my library completely to my agents, but that's a big step to take.'

Although much of his work displays exemplary use of light, movement and composition, Ferrero is reluctant to admit to having a particular style: 'It's

hard to find a new way of photographing. I don't feel I need a style. Every time I see a different subject, I have one way to photograph it and I just don't care what has been done before. I think the light and the way I feel at that moment command the way I work.' He is concerned to 'take pictures that show very well what must be shown and what I think should be included in the picture.'

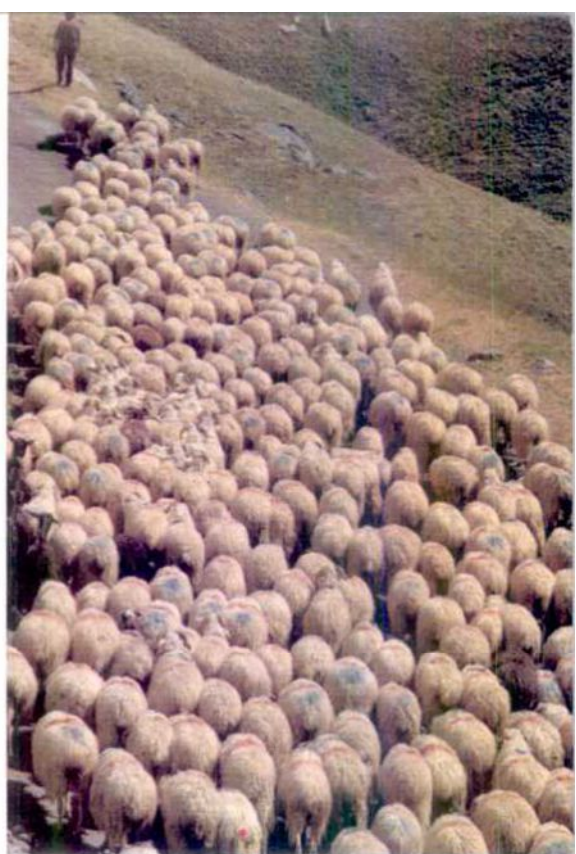
He recognizes that his work is constantly and subtly developing and changing. 'I'm much more involved in movement now and in showing animals in their environment, like the picture of the lizard which I saw on a rock at the top of Bluff Knoll in Western Australia. That species was only named two years ago. Before that it was considered to be a subspecies. This is one of the first pictures ever taken of it in the wild.'

In the pursuit of his subjects Ferrero has also found that it is not only planning, research, and immense patience that are essential. He also has to learn to deal with some of the endless problems that beset any photographer who works far from the resources of so-called 'civilization' and often in dangerous situations. Vehicles may break down in the middle of deserts and once while waiting to photograph a kingfisher he stayed up all night in an Australian rain forest and got completely covered with leeches.

To get his pictures, Ferrero travels with a lot of photographic equipment. He goes prepared for any eventuality. 'When you rely on taking pictures to make your living, you can't afford to take any chances. I really hate to be in a situation where through lack of equipment I can't take the picture I want to take.' As a result, he ends up travelling with four cases of equipment weighing over thirty kilos in all.

These contain F2 and FE Nikons, as well as a special motor-driven Nikon which takes up to ten frames per second.

Stud farm in France (left) photographed for *GEO*, and the rare Siberian crane (below) in Bharatpur, India



Shepherding the flock A perfectly framed picture of a group of sheep taken in rural France

He also carries a wide range of lenses—18, 24, 105, 150, 155 macro, 180, 400 and 500 mm. In addition he carries a medium-format outfit—a Mamiya 6×7 with 37, 50, 90, 180 and 360 mm lenses.

When taking light readings Ferrero prefers a hand meter. 'I don't really like the automatic TTL meters. You get so many problems with batteries—you just can't rely on them.' Instead, he uses a Pentax Spotmeter with a one-degree angle of acceptance. 'It's very good, but it was hard for me at the beginning because you don't know what you're measuring. You can make mistakes so easily, but once you know how to use it you get beautiful exposures. I'm beginning to know about different lighting conditions now—I've got a spotmeter in my eye.'

Ferrero also travels with two Norman flash units and a Linhof tripod which he values greatly, after being let down in the field by other well known and highly respected brand-name tripods. However he uses little other special equipment. 'My basic filter is a polarizer and that's it, although I may sometimes use correction filters if I have a particular film in my camera.'

Black and white film holds little attraction; Ferrero works almost exclusively in colour. 'I prefer Kodachrome for sharpness but not so much for the colour rendition. It's harder and harder to get a good green. For colour rendition I prefer Ektachrome 64.'

Processing faults have also plagued Ferrero from time to time: 'I've had a lot of problems with scratches and colour shifts in my film. On a roll of 36 exposures I will only take 12 usable pictures as I take each photograph three times. I've



Jean-Paul Ferrero/Ardea Photographics

World of photography

seen colour shifts on consecutive frames with Kodachrome, but when you get a good picture then it's perfect.'

In the near future, Ferrero may well be switching completely to a 5 x 4 inch view camera. 'Just to control depth-of-field and camera movements, and to get a certain type of picture that I can't get with anything else but a view camera.' Although undeterred by the extra weight of this large format equipment, he recognizes the need for a reliable vehicle in his line of work. In Australia he has a Land Rover which he can sleep in while on different assignments.

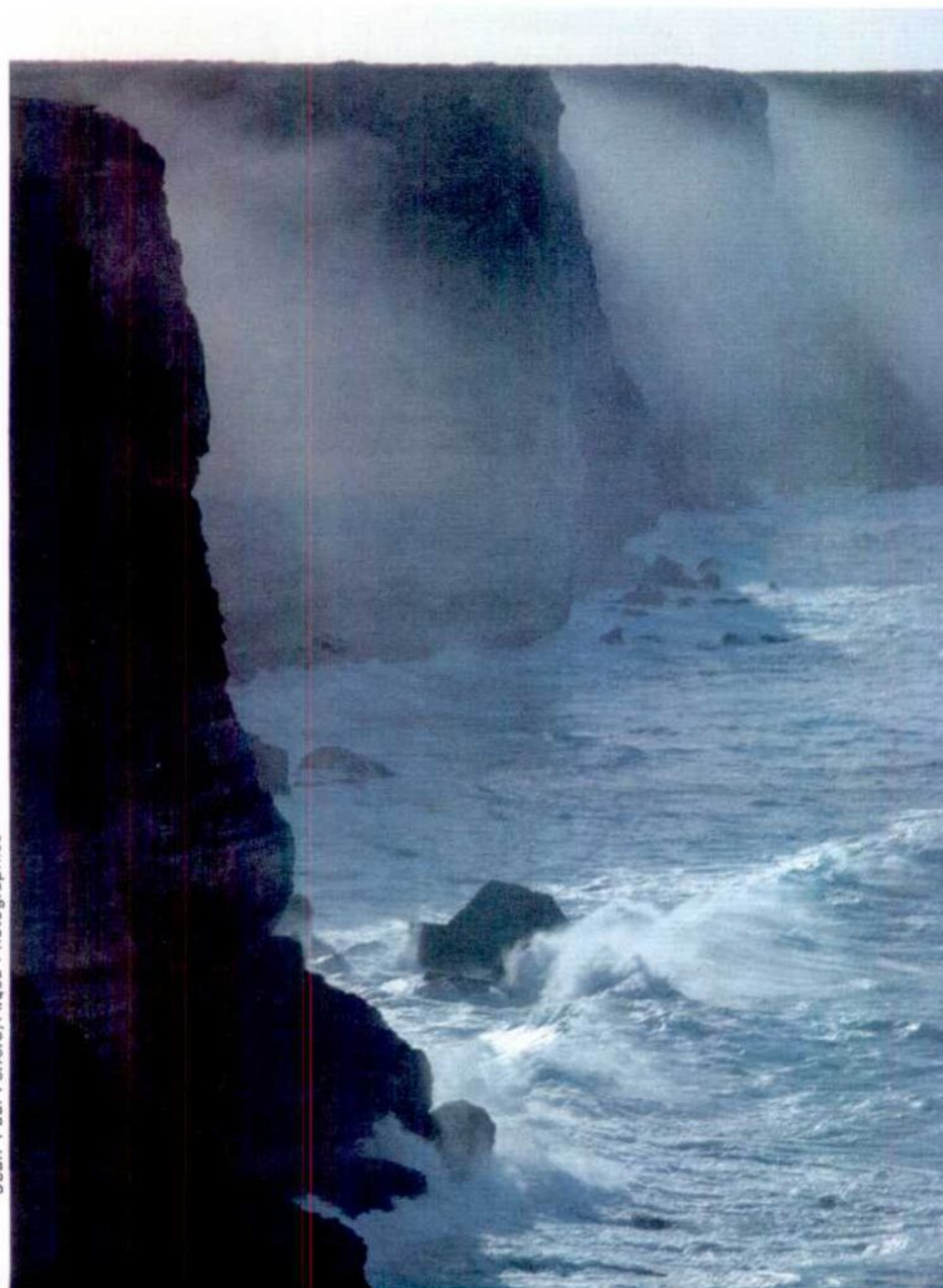
His realistic and meticulous approach to photography also ensures that he takes precautions against heat or humidity affecting his film and equipment. 'When I'm travelling in the heat I never carry all my film with me. I stop some place and have it stored in a fridge. In tropical climates I always keep my equipment packed in silica gel inside tight boxes.'

In spite of the amount of equipment that Ferrero carries on assignments, his



Sea cliffs The majesty of these cliffs on the Great Australian Bight are emphasized by the shafts of sunlight

Thorny devil A strange feature of the harsh deserts that cover most of Central Australia



advice to would-be wildlife photographers is very simple and direct. 'Rather than having a lot of equipment, buy a really good body and lens. Then carefully choose the thing you want to photograph and stick to it for a long time.'

'For instance, if you want to photograph red deer, look at all the pictures that have been taken of it, read everything, study it. Then choose the place where you are going to photograph it, carefully using your knowledge of the subject. What I'm trying to emphasize is the amount of time and involvement needed for a certain type of photography or subject. The equipment comes later—you discover it in the course of finding out what you want to do.'

'If you go to Kenya, or anywhere else, to please yourself and to take pictures of the wildlife there, don't expect to suddenly become a good wildlife photographer. It takes much more than that. Taking just one good picture is one thing, building up a story is a very different matter. It's very hard.'

It is only in the last few years that Ferrero feels that he has become a real professional with the quality of photographs that the term implies. He is very aware that to make a name in the specialist and competitive world of wildlife photography takes a lot of time. 'There are probably fewer than 30 professional wildlife photographers in the whole world who are working regularly and getting work published.'

'I have also discovered that all the best known wildlife photographers are in their late 40s. Being in my early 30s, I shouldn't be in too much of a hurry. Time is the vital factor—you have to wait.' Ferrero's unwillingness to be considered an established leader in his field also indicates his continuing dedication to his chosen profession. However, it is also clear that in spite of his youth he is already considered a wildlife photographer of considerable repute.



Creative approach

Still life

Still lifes can show the photographer at his most creative—even the most mundane things can be subjects and it is the photographer's skill in identifying and arranging them that is the key to success

Of all the subjects that challenge the photographer to demonstrate creativity and originality, still life can be one of the most rewarding. However, it is a subject which many photographers, except for a few select specialists, tend to overlook. Perhaps the term 'still life' puts off many photographers because it conjures up traditional painting themes of bowls of fruit and vases of flowers, but little else. As such it seems to be less exciting and less exacting than action photography, photojournalism, or portraiture. Exactly what the term covers is very often misunderstood. Some examples taken from personal experience may show, far better than a set of definitions, what a still life can be.

You may be, for example, on holiday and taking a stroll along the waterline of the beach. Washed up in the surf, and now tossed aside in the sand, you find a child's toy. It is a small, tattered doll with one arm missing, a sad little object, but you stop to look at it for a moment. Now you notice not just the doll on the glistening wet sand, but also that its one arm appears to reach out for a pretty pink shell. Just beside this a small piece of driftwood sticks up, throwing an interesting shadow, like a pointing finger. The chance grouping of these objects may well have been completely accidental but it has resulted in an interesting combination of different shapes, colours and textures which you can call a still life. It may be worth photographing the group just as they are, from above as you first saw them.

On the other hand, instead of taking the group as you found them, you may decide to try to improve on the natural arrangement, and perhaps to put something of yourself into the picture. You may add to the photograph if you simply study the composition in your viewfinder, considering different angles and ways of framing the subject. You may decide to come in very close and frame your picture tightly from a particular angle, so as to exclude an unattractive object which may be intruding on the composition. You may want a viewpoint which includes a complementary natural background, such as the sea, a rock or a fishing net. Moving a step further, you could rearrange the group or move them to a more pleasant part of the beach or to a studio setting.

After the initial discovery, actions such as these—the attention to detail, the arrangement of elements, the repositioning of the camera—turn a still life into



Howard Kings-North

something stimulating, creative and intensely personal. It is your choice and your creative attention which counts in still life and success stems from the originality, deftness and artistic sensibility of the photographer. The example of the group discovered on the shore line is a still life of a particular kind. Once you become aware of the possibilities of these *objets trouvés*—'found objects'—you will begin to see potential still lifes all around you. One interesting object may catch your attention as a start and may lead you to combine this with another object with a different shape or texture. You may then remove both of these to a position where the light reveals their characteristics better or where a less cluttered background shows up their shapes. As you rearrange things in this way, you are taking a step

Black and blue An unusual viewpoint on an object as mundane as a coffee cup—its texture echoed in the background—creates a strong abstract design

towards the type of still life which is entirely 'arranged' and which can be even more challenging. Advertisements provide countless examples of this type of still life in which a composition of different objects is united by a certain theme to create an image.

A packet of cigarettes, for instance, opened, with the inner foil pulled aside to reveal the filter tips, is on its own a basic still life. But when the packet is shown beside an elegant cup of black coffee with a swirl of cream on the surface, it starts to be something more. If, in addition, there is also an evening glove and part of an evening bag shown

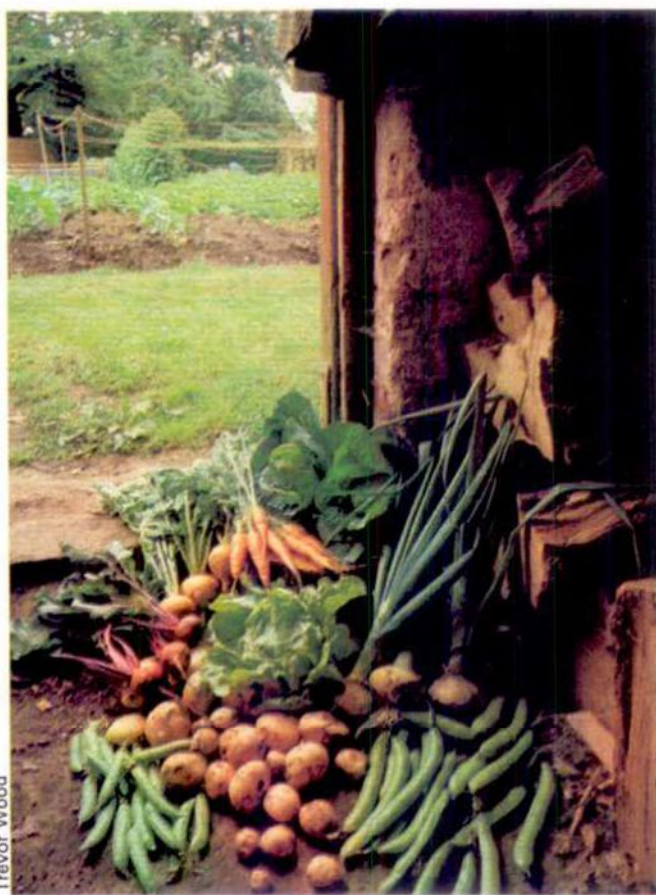
Peter Williams



Neil Menneer



Trevor Wood



Peter Williams



to the right of the coffee cup and a pair of opera glasses lying on an opera house programme beside the packet of cigarettes and slightly under them, then you have an example of a completely 'arranged' still life.

If you consider this imaginary advertisement, it becomes clear that this is not a random selection of objects but that each has been carefully chosen to contribute towards a particular theme. In this case, the theme could be described as one of elegance. The advertisers want their brand of cigarettes to have a glamorous image and have designed the photograph with this in mind. On closer inspection, you may notice that the lighting, in particular, contributes towards the mood of elegance. Directional lighting with pronounced shadows helps to suggest the end of a formal night out. No detail in a still life should be overlooked when the success of the whole effect depends on all the elements mentioned combining to create a complete image—not simply a collection of mundane objects.

A classic example of a still life which is a success for just this reason, is called *Theatre accident: the spilled handbag* taken by the American photographer Irving Penn. The colour photograph contains 18 separate objects, 16 of which have spilled out from a gold lamé handbag that has dropped on the floor beside a foot in a black patent leather shoe in the corner of the shot. The foot, the bag, and the objects that spill from it are looked down on by the camera above them. The miracle of this particular still life is that all these different things, apparently dropped and falling out at random, fuse together into a whole that is totally effective. Every object was selected to contrast with or complement the others by its material, its shape and its colour. The actual arrangement of each object that has 'fallen' from the bag leads the eye on a swift journey of satisfaction.

The glory of still life photography is that it really does not require either sophisticated apparatus, a big studio set up, or professional lighting systems. Nor does it require complex arrangements to be wholly satisfying or fully creative. A country loaf, a wooden bread board, a breadknife, a fat hunk of farmhouse cheese and an apple or two (one of them a windfall with a leaf or two attached to the stalk) could make a wonderful still life. So could a bunch of

Neil Menneer



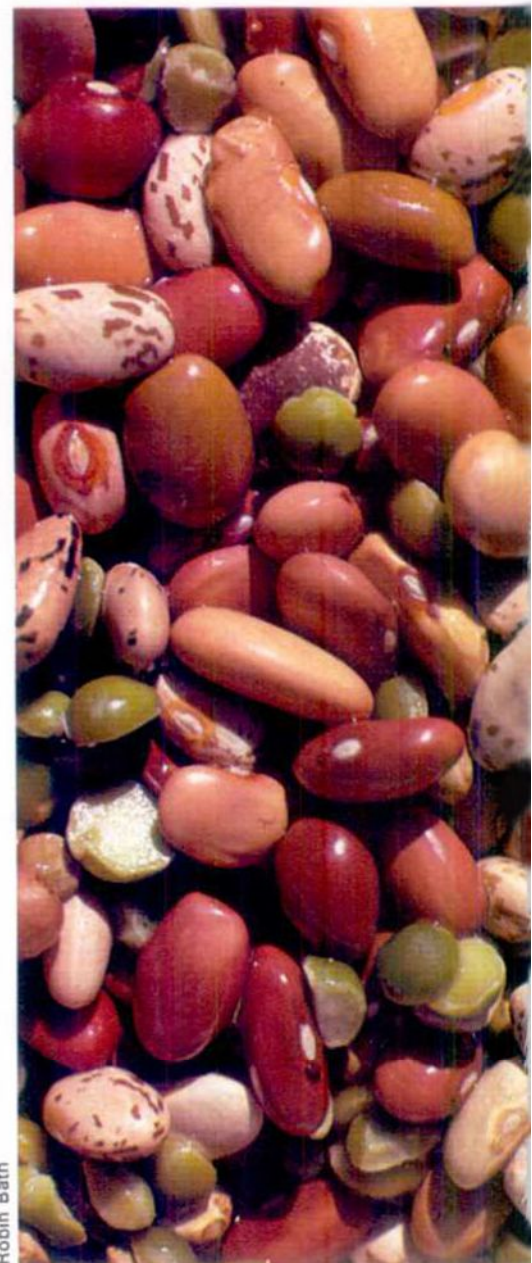
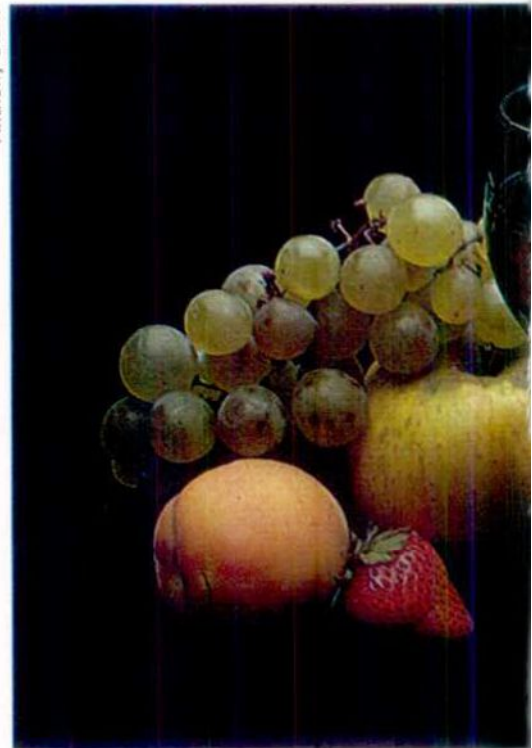
Virginia Woolf's desk Carefully chosen and arranged artefacts evoke something of the writer and the way she worked.

Pink cockerel Beaches are always good places to look for still lifes—here direct sunlight makes unpromising rubbish part of a strong composition.

Vegetables A natural setting can set the tone for the subject. **Tulips** A sign of unfinished activity—an artist's crayons resting on the paper—enlivens a still life. **Pencils** Close in and look for colour, pattern and texture



Anthony Blake



Robin Bath

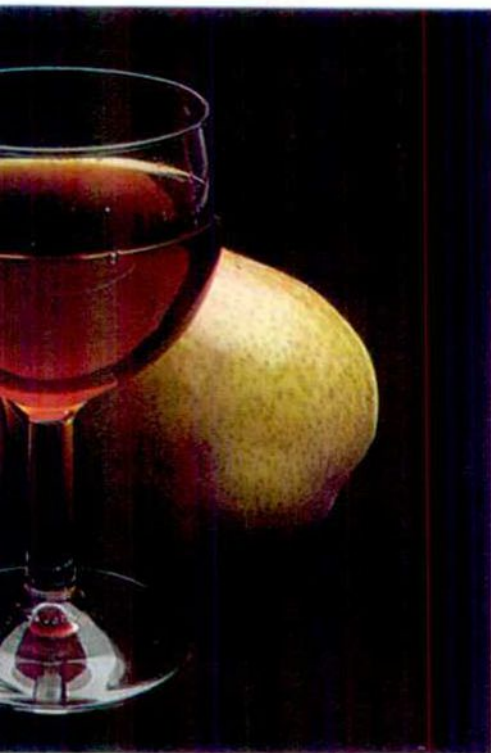
flowers, freshly picked and not yet arranged, or the catch of a weekend angler, a box of old buttons or a tin of cotton reels of different colours. Any job, craft, or hobby can throw up endless examples.

While the raw materials of still life are not difficult to find, the composition of the different materials is the most crucial part of this type of photography. Bear in mind that very often the best still life is the most simple and that a simple still life, if successful, will contain only one dominant element. Once you have chosen several attractive or favourite objects for a still life, it may not be that easy to select only one as the dominant part of the composition. It may be best to put aside personal preferences, if you can, and decide which one presents the most positive shape, colour, or texture and make your choice for these reasons. Take a good look at this one item through the viewfinder and add to it slowly and carefully, considering why you have

The morning catch A background of boats and soft morning light that brings out the subtle colours and textures creates an image of fish fresh from the sea. Beans Even simple subjects need arranging to give a balanced pattern

added a particular object, what it contributes to the composition, and whether it may detract from the dominant element, or not. The rule of a dominant object holds good for every type of still life, however many separate elements are made to coalesce around it. In an advertising still life the dominant element must be the product. The Japanese know that a single twig of cherry blossom in the right container with, perhaps, a few stems of ornamental grass, is far more effective and will give far more lasting satisfaction to the eye than a commercial florist's elaborate arrangement.

Once you have chosen the separate pieces for your still life, check that the



J. P. Lescaudret/photogram

Wine and fruit A classic still life—delicate lighting and a dark background to highlight the subject cluster

arrangement is satisfying. The eye is satisfied by a feeling of order, harmony and a sense of balance, however random this may seem to be. A classic still life is simply a chess board showing an unfinished game. The chequered board provides order, harmony and balance, and yet a feeling of variety. So do the variously shaped and sized chessmen. Whatever the state of the game, however many pieces have been lost in the course of play, the chess board works as a still life.

Apart from the feeling of harmony, order and balance, the eye is satisfied by the feeling of variation on a theme. A fresh catch of fish, still wet from the river, for example, provides variations on the theme of fish, since the sizes, colours and shapes of fish may be different. A fishing rod and a wicker basket included in the shot will add variety and interest to the fish while remaining related within the same theme. The bright quill of a float or fly will add a touch of contrasting colour, a key accent, which you should, ideally, try to include also.

The background to any still life needs careful attention. The fisherman's catch, still in its basket, may look much better and more natural out of doors, with a grassy river bank stretch as the only background interest. Objects with fine detail will be set off best by a plain and simple background. Flowers, for example, or the tin of cotton reels mentioned before may be lost against a brightly coloured background, whereas a still life of simple, stone coloured pottery may well need a strong background colour to add interest to the picture.

The lighting of a still life, although in a sense it is the last thing you have to consider, is of paramount importance. Objects with shiny surfaces, such as glass or metal always need quite

different lighting from, for instance, the loaf of bread and the farmhouse cheddar. When your arrangement has been set up, try to begin with one main light source, whether it is a window or a studio light. Look at the direction from which the light is coming, and how this affects the different objects you have chosen. If necessary, move your light source or, in the case of daylight, your still life to a different position to the light. Consider whether the light brings out the textures of your subject, and whether it creates unwanted or confusing shadows. Once you have the shadows as you want them, you may need to pay attention to the highlights. 'Hot spots' on shiny surfaces are best dealt with by diffusing the light source. But if extra highlights are desirable, a simple solution is to place small hand mirrors just outside the picture. These can lighten shadow areas or add highlights, as necessary. Sharply angled side or low lighting that catches a surface is an important way of revealing texture and can be used in addition to the main light. Sometimes you can reveal texture simply by repositioning the object. Turning your loaf of bread towards the light may be enough to reveal the open texture of the bread, for instance. But remember that the lighting should always add something to the subject and never detract from it.

Taking successful still life photographs does not require either elaborate apparatus or a studio set-up. Keep the composition simple, remember to provide a dominant object as the centre of the whole, try to introduce some balance and harmony to the group, choose the lighting and background that complements your subject, and you will find that photographing still lifes gives you a sense of achievement, and will be appreciated greatly by your viewers.

Mushroom picking Still lifes often work best when they tell a story—warm tones and backlighting help recreate a traditional summer's morning



Bob Croxford



From colour to B&W

Many photographs have far more impact in black and white than they do in colour—why not try printing some of your colour negatives on to black and white paper to create an entirely new picture?

Most photographers, these days, use colour films as a matter of course. But there are occasions when black and white is much more suitable, or when you simply want to record a scene in black and white.

Although one solution to this would be to carry two cameras loaded with different films, this can be expensive and tiresome. Fortunately, there is an inexpensive solution to the problem. You can make black and white prints both from colour negatives and from colour transparencies. Neither requires any special treatment, and the techniques are the same as those for normal black and white printing. Although the processes are slightly more complex, the results can be of very high quality and, in most respects, virtually indistinguishable from a normal bromide print of a black and white negative.

To make a black and white print from a colour negative, you can either print it directly on normal bromide paper—which gives greatly distorted tone rendition—or you can use panchromatic paper made especially for the purpose. Transparencies can be printed on a special reversal paper, but for best results you should make a black and white intermediate negative, and then print it on to normal bromide paper.

You can also make prints from transparencies using an intermediate paper

negative. This produces a high contrast print, and although the results are not usually of the highest standard, they may be adequate for some purposes. Colour transparencies and negatives can both give black and white transparencies of acceptable quality when copied or contact printed on low speed fine grain panchromatic film.

Printing from colour negatives

You can print a colour negative on ordinary bromide paper, but this is not usually satisfactory because ordinary bromide paper is sensitive only to blue light. This means that only the yellow image of the negative in the print is recorded since both the magenta and cyan images are completely transparent to blue light. The result is that the tones in the print do not correspond to the tones in the original scene—things that were blue are very light in tone while all other colours which do not reflect blue reproduce as very dark or even black.

In addition, colour negatives are based on orange coloured film. As orange absorbs blue light strongly, printing exposures tend to be very long.

While normal bromide paper is acceptable for checking picture content or making contact prints, for a good quality image you should use panchromatic bromide paper—such as Kodak Panalure II RC—for printing

colour negatives. This paper gives correctly balanced tones in black and white, and the results are similar to straight prints from black and white negatives.

Panchromatic paper is sensitive to light of all colours, so you should ideally handle it in total darkness, although you may use a very dim amber safelight (Wratten 13) if you prefer.

The paper is processed exactly like ordinary bromide paper and no special chemicals are required. Although development time can range between 1½ and 2½ minutes at 20°C, you should use a standardized processing time. This is because you must process the paper in darkness or under very low level illumination and you cannot see the image appearing as you would in conventional black and white printing.

Set up your enlarger as normal and make an exposure test print in steps. Panchromatic paper requires a shorter exposure than a comparable enlargement in normal black and white printing. As a guide, 10 seconds at f/11 should be adequate for a 20×25 cm enlargement from a 35 mm negative.

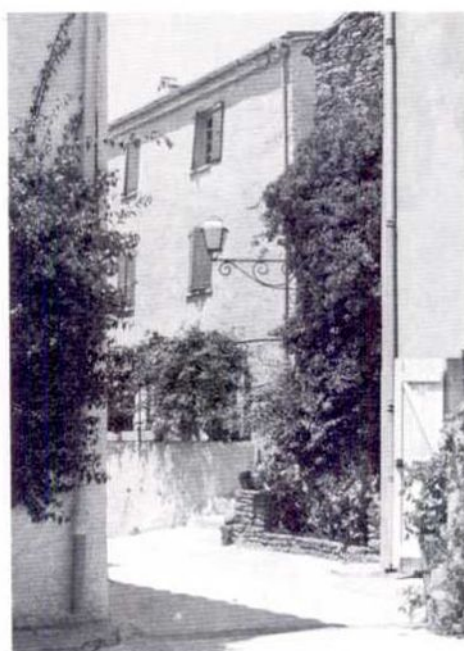
After processing, your print should look like a conventional print from a black and white negative showing deep blacks and clear highlights.

If you wish, you can use the properties of panchromatic paper to pro-



John Ward

Problem for B & W Subtle differences in light colours, isolated patches of bright colour, and severe contrast make this hard to print in black and white



Ordinary bromide On ordinary bromide paper, even a good print from the colour negative looks flat but it is suitable for quick proof printing



Panchromatic paper Printing the same negative on Kodak Panalure II RC paper gives a better, more realistic separation of tones, and stronger blacks

Using colour printing filters

One of the attractive features of making black and white prints from colour negatives is the degree of control you have over the tone recorded for each colour in the original scene—providing you print on panchromatic paper, such as Kodak Panalure II RC. If the tones in the black and white print are to correspond to their value in the original—that is, if the print is to look similar to one made from a normal black and white negative—you can make a straight print (below left). But just as you can use filters to alter the colour balance when printing in colour, you can use filters to alter the tone given

by each colour in the black and white print. For the print below right, a yellow filter was used and the effect is similar to using a yellow filter over the lens when shooting in black and white. Anything blue in the original scene is darkened so that white clouds stand out against a dark sky. To lighten the tone recorded for a colour, print through filters of the same colour: to darken the tone, use filters in its complementary colour. The effect of filters is to alter the colour of the printing light and the results given by various coloured printing lights are shown in the colour patches reproduced below.



Colour patches Compare how filtration affects the reproduction of this colour scale on Kodak Panalure II



Without filtration White light printing without filtration gives the most satisfactory reproduction of the original



Printing with yellow light Yellow is lightened significantly but otherwise the black and white reproduction is very good



Printing with blue light All colours containing blue are lightened; other colours are unaffected



Printing with magenta light The scarlet/magenta patch is lightened and yellow and red match purple and blue in tone



Printing with green light Brown, purple, scarlet and red are darkened to a point where they are almost black



Printing with cyan light Blue is lightened slightly but all other colours are darkened



Printing with red light Colours containing red light are lightened, yellow is unaffected, blues are darkened



Using an interneg *The best way of making a good quality black and white print from a colour transparency is to produce an internegative on panchromatic film. Cut down excessive contrast by overexposing slightly and then underdeveloping. The best quality can be obtained by making an enlarged copy negative and contact printing it*

duce special printing effects. Since the paper is sensitive to light of all colours, you can use colour filtration to control tone values in the print. The result is the same, in practice, as that obtained by using filters when actually taking black and white photographs.

To darken a colour in the image, make the print exposure through filtration of its complementary colour. So, to darken a blue sky, insert a yellow correction filter in the filter drawer before making the exposure. If your enlarger has a colour head, simply dial in the required amount of filtration.

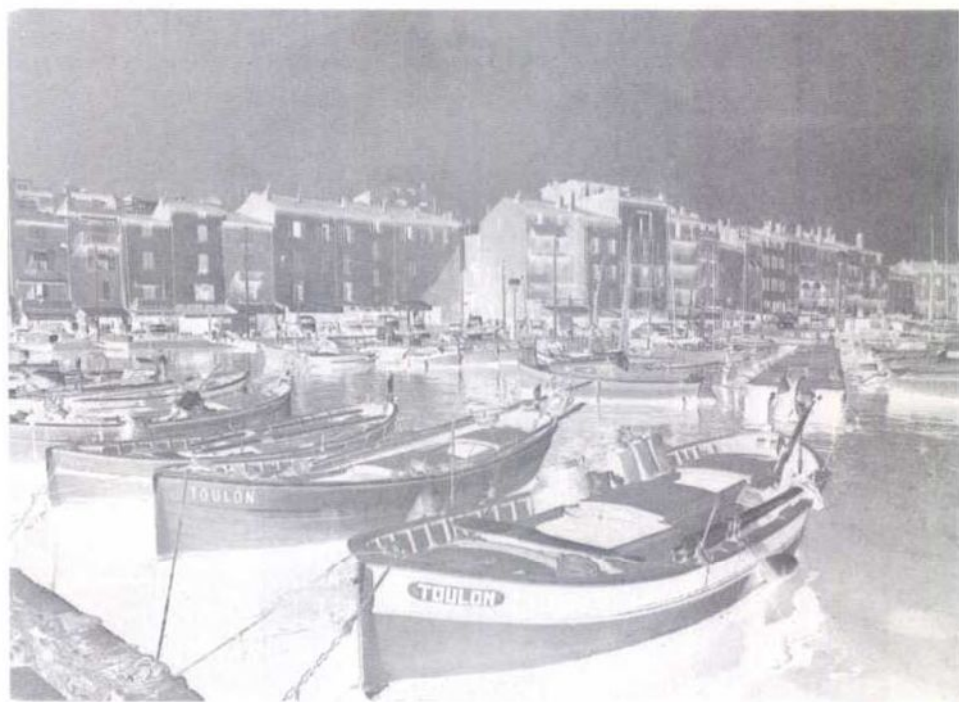
The exact amount of filtration you need depends on the effect you want to create, and can only be found out by trial and error. However, as a rough guide you should start off by using filter values of between 50 and 100, and increase or reduce them as needed to produce the tones you want. With practice, you can achieve a fine degree of control to produce virtually any alteration of tones.

Printing from transparencies

There are four different techniques for obtaining a black and white image from a colour transparency, each with its advantages and disadvantages.

The best image quality is obtained by making an intermediate negative, and there are two different ways of doing this. You can either make a colour negative and print it on panchromatic bromide paper, or you can make a black and white copy negative and print this on normal bromide paper. Of the two methods, the former allows you more control because you can use filtration at the printing stage. The latter is, however, much more economical, as no special materials are necessary.

Alternatively, you can print the transparency directly on a special black and white reversal paper. This paper is normally used for reproducing line



John Ward

drawings and diagrams, and is not capable of giving the same standard of quality as the internegative method. Even so, it can give surprisingly good results if used with care, and has the advantage of speed and simplicity.

The fourth technique is to use an intermediate paper negative—a method covered fully in a subsequent issue. Although not suitable when faithful image reproduction is required, it can still give good pictures. Its particular advantages are cheapness and simplicity.

Using an internegative

To make a black and white intermediate negative, first copy the transparency on to black and white film. You can use an SLR, ordinary film and a slide copying attachment for this. A full description of the techniques appears on pages 726 to 729. Alternatively you may prefer to

make same-sized copies by contact using a suitable panchromatic film such as Kodak Panatomic-X or Ilford Pan F in 35 mm rolls. If you have access to large-size sheet film, you may prefer to make a copy enlargement by using your enlarger to print your transparency on this material. The resulting print-sized negative is then contact printed on normal bromide paper to give a black and white print.

Whichever method is used, it is best to make a range of exposures so that you can select the negative which has the best density for your purposes. If your negatives are correctly exposed and properly sharp in the first place, the resulting prints should be of good quality.

If you want to make a colour negative from an original colour slide, proceed in exactly the same way, but print it on



Direct reversal For quick proofing of colour transparencies you can use a direct reversal material such as Kodak Kodagraph Transtar. Not all subjects reproduce well—mottling may occur in large areas of one tone—and you may find that a 'straight' print (below left) is considerably improved either by localized exposure control, or by giving the print a separate flash exposure to white light (below right)

panchromatic bromide paper. This method allows you to introduce filtration at the printing stage. If, however, you do not need to change tones, you might as well use the more economical black and white negative method.

You can go a stage further and make a black and white transparency from a colour original. To do this from a transparency, make an intermediate 35 mm negative by one of the methods outlined, then contact print it on Fine Grain Positive film. The high contrast and high resolving power of this film, available in 17 m rolls, gives better results than conventional negative film.

When working from a colour negative, you can print it directly on the same film. In this case, you inevitably lose some tone values, as this film is insensitive to red and green light, like paper emulsions.

Black and white reversal paper

When time is an important consideration, you can print on reversal paper such as Kodak Kodagraph Transtar Paper TPP5, a material you will have to order from your dealer.

This paper is orthochromatic—that is, sensitive to blue and green light—and can be handled under a red safelight, but because of this it reproduces all reds as dark tones. The paper is normally only used for sizing proofs, so this handicap is not normally serious, but it can create difficulties when accurate tones are required. There is, however, nothing you can do to prevent this as no amount of filtration can make the paper

sensitive to red light.

To print on this paper, insert the transparency in the enlarger and focus the image as normal, then make a test strip in the normal way. You will probably find that the correct exposure is about 60 seconds at $f/8$ for a 25×20 cm print from a 35 mm negative.

The paper is processed in the same way as bromide paper, using standard paper developer. Development time is 2 to $2\frac{1}{2}$ minutes at 20°C . The results will be contrasty because the paper is meant for use with line originals. You can try to control this by dodging, either by holding back the shadow areas or giving extra exposure to the highlights.

Another way of reducing the contrast of this paper is to give the paper a 'flash' exposure to white light. This is most conveniently done after your original exposure and before processing. The precise amount required depends upon the amount of contrast reduction which is required. A lower initial exposure is used, as the flashing exposure increases the speed of the paper. This is most apparent in the shadow regions of the image, so causing a reduction in contrast. Start with about two thirds the normal exposure and give a flash exposure of about 10 per cent of this value. The easiest method of giving a flash exposure is to remove the slide from the enlarger negative carrier after the first exposure has been given. Reset the enlarger timer to 10 per cent of the original exposure time and give the second exposure.



Basic lens testing

For a really sharp picture, a lens must be able to render the tiniest features of a subject clearly and a number of simple tests have been devised to establish just how much fine detail it can resolve

Most people have had the experience of taking what they thought was a good shot only to find, when looking at the print or slide, that it is not as sharp as they anticipated. There are a number of reasons why this happens, including camera faults and poor technique. But lens faults are also a significant cause of poor results, so it is useful to be able to test the quality of lenses.

The function of a camera lens is to reproduce, as accurately as possible, an image of the original subject. The perfect image is unattainable, however, as lens aberrations cannot be fully corrected. This means that the image quality inevitably varies from centre to edge, and at different apertures. And even an otherwise perfect lens suffers from the effects of diffraction.

In addition, the complexity of a lens and the fact that each element is ground and polished individually, rather than being cast from a mould, means that individual variations and the accuracy of assembly will give variations in performance from sample to sample of the same design. To achieve quality control, and as a final check by the purchaser, various lens tests have been devised most of which determine the resolving power. All of them are useful, but no single test can give a full picture of performance.

Lens testing charts

The assumption is that the complete assembled lens is to be tested, and not the individual elements. A prime criterion of performance is the resolving power (see page 1054) of the lens. This is its ability to distinguish between closely adjacent points in the subject, as limited by residual aberrations and diffraction.

To test for resolution, and obtain a numerical value for it, a test chart (sometimes called a bar or target chart) is used. Instead of point sources, this has short



Kim Sayer

parallel lines printed on paper. Many patterns have been devised, but most use black bars or lines with a length to width ratio of 5:1, printed on a white background. These are often grouped in two sets of three, with each set at right angles to the other, to test for astigmatism (see page 906).

One bar or line with its adjacent space is called a line-pair. Resolving power is expressed in terms of spatial frequency—that is, the frequency with which the lines appear on the image—and this is measured in line-pairs per millimetre or lpm—also sometimes known as cycles per mm. The bars are in groups of decreasing spatial frequency and distributed over a large area—often more than a metre square—to cover the whole field of view of the lens. If a bar has a width of 0.1 mm, the line pair is 0.2 mm wide, and gives a spatial frequency of 5 lpm.

This is the fineness of detail which the average human eye can perceive in a

6×8 inch (153×203 mm) print at a distance of 250 mm. This frequency is often quoted as a minimum standard for resolution in prints. But although the spatial frequency which must be resolved in the print is only 5 lpm, for a 35 mm shot to produce this result the image on the negative must resolve 30 lpm, as it needs a ×6 enlargement to reach the required print size. Most lenses will give far better resolution than this, even at full aperture, so greater enlargements are possible.

When a test chart is photographed, it is very unusual for the image size to be the same as the object size (1:1 reproduction). The size is reduced in the image. A 5 lpm pattern which is reduced 20 times will produce a spatial frequency of 100 lpm on the film.

Tests for resolving power also depend on the Target Optical Contrast (TOC). A high contrast helps to distinguish between the lines and spaces and so favours a

Fall off With every lens, definition deteriorates towards the edge of the frame

higher value for resolving power. Most test charts have a high TOC.

Photographing the chart

The actual image of the test chart formed by a lens can be examined using a microscope. This prevents the results being affected by the film and processing. But for most people it is necessary to record the image on film and examine the negative.

It is important that the chart is evenly illuminated and photographed with the camera solidly supported, with the film plane parallel to the chart. The position of the film in the camera is normally marked by a film plane symbol, a circle with a line through it. The distance from the lens to the chart is 26 times the focal length of the lens, which gives a 25:1 reduction from chart to image. By using this set up, the chart fills the frame, and the

spatial frequencies of the bars in the image correspond to the values on the chart.

The chart is photographed using a slow, fine grain film in order to record as much detail as possible. The film is exposed and processed carefully, as too much or too little exposure or development can affect the results. Even when perfectly exposed and developed, film cannot record all the detail given by a top quality lens. So the information about performance given by these tests is for the lens plus film combination.

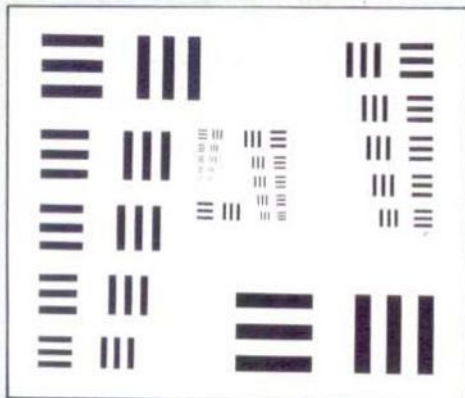
A line or bar is resolved if it can just be distinguished from the background. Practice is needed to judge this, and a powerful magnifier or microscope is required to examine the negative. This technique does not allow the absolute performance of the lens to be measured. But standardizing the film and development allows different lenses to be compared. Furthermore, the same lens can be compared at different apertures, and across the field of view. The accuracy of the focusing system or scale can be checked by repeating exposures at various settings of the focusing ring. Any darkening of the image towards the edges shows that the lens suffers from vignetting. And distortion—barrel and pincushion—is revealed by bending of the straight edges of the chart.

A typical resolving power for a good lens is 100 lpm at the centre of its field, dropping to 35 lpm at the edge at its best aperture.

Infinity tests

By their nature, test charts must be photographed in-

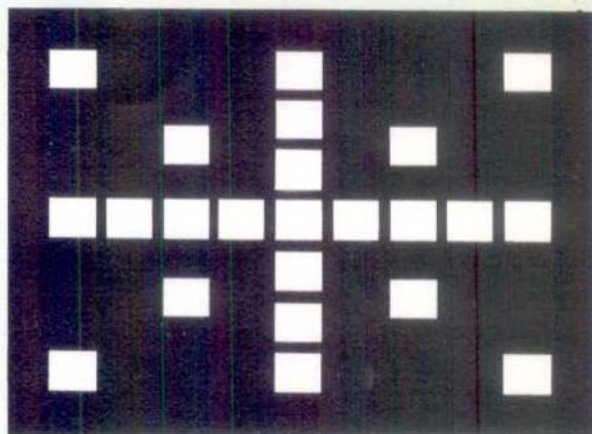
Infinity test The collimator set-up effectively produces a subject at infinity, and can reveal lens aberrations



Test charts The basic design (left) is repeated over a large area (above right).

Another chart design is shown on the right.

These illustrations cannot be used to make your own tests

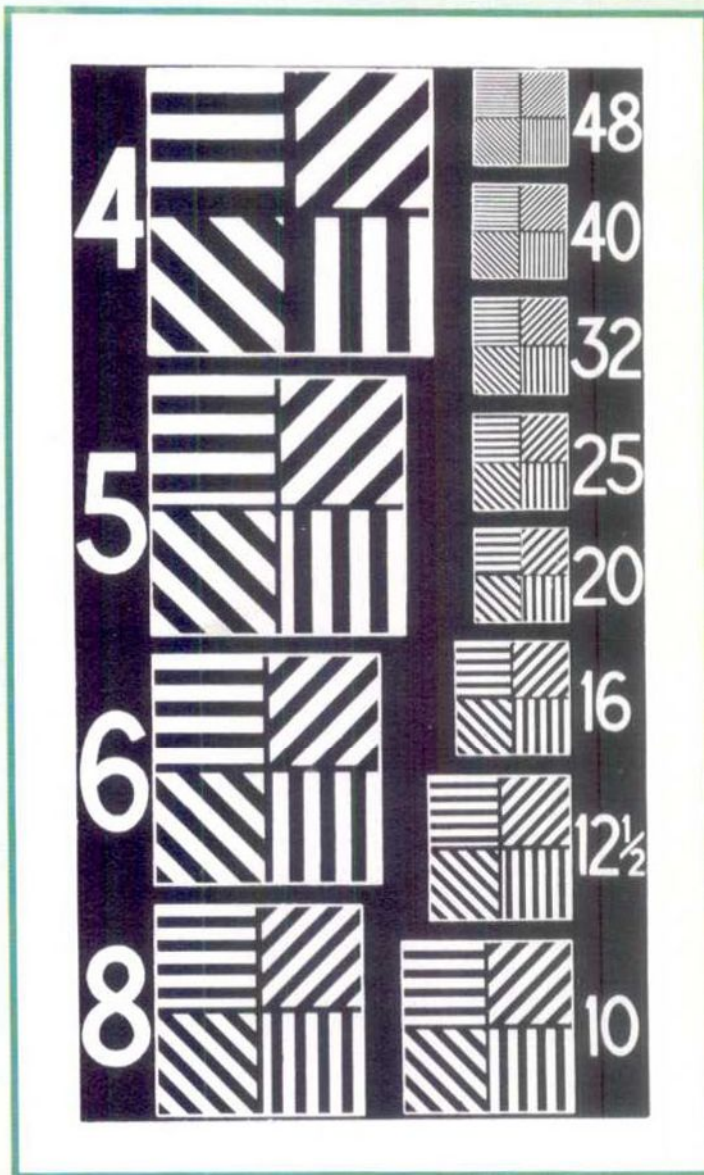


doors at comparatively close distances. This can be unsatisfactory for a number of reasons, the most important of which is that most lenses are designed to perform best with distant subjects.

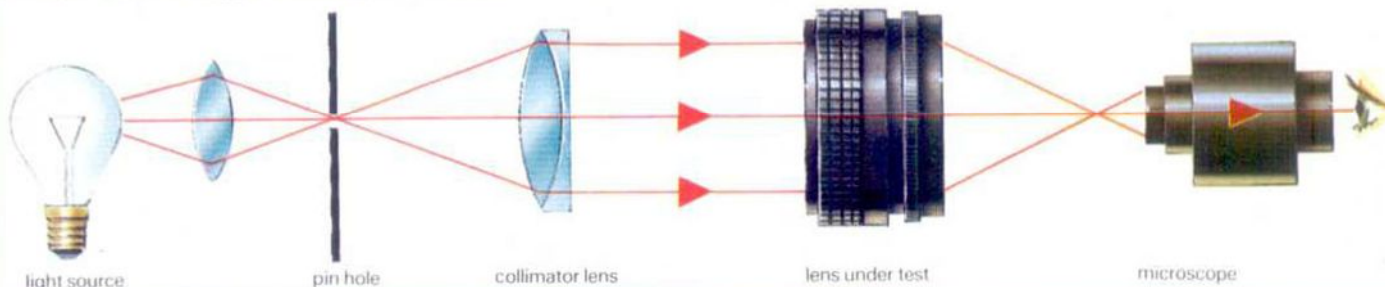
One way to simulate an infinitely distant subject is to use a collimator. This is a well corrected lens used to form a tiny point of light, which then becomes the object for the lens under test. This is called a star test, and a number of aberrations, such as coma, can be detected by it. If such aberrations are present, the point is distorted. However, this is a laboratory method which, once again, uses a microscope to examine the actual image formed by the lens, rather than using film.

MTF tests

Testing using bar charts only gives an indication of resolution. The slightly more subjective aspects of sharpness and definition are not accounted for. A more sophisticated test method, using the Modulation Transfer Function (MTF) can allow for contrast (which affects sharpness) and is dealt with in a subsequent article.



Star testing using a collimator





World of photography

Brian Griffin

Brian Griffin is a young English photographer who produces haunting, evocative portraits. By his very individual use of light, he creates striking images to illustrate his subject's personality

'I went to the camera club every Wednesday night for five years and drank tea and ate biscuits and went out and photographed frost on the canal in winter and flowers in landscapes in summer, and entered all the photographic competitions. But I never rose above the beginners' class.'

This was the apparently unlikely start of the meteoric career of Brian Griffin, the photographer responsible for some of the most haunting and evocative images now being produced in Britain. But Griffin is an unusual photographer and, once he had decided to make a living from photography, he quickly developed a highly original and contemporary style.

He is now a successful and respected professional, specializing in portraiture and working on commission for a wide range of clients including record companies, international magazines and

advertising agencies. His approach to his work is primarily that of a painter. When he goes to take a portrait he will not only try to relate his approach to his subject but will also bring in his own interpretation of his subject's work, his personal preoccupations and visual ideas springing from many artistic influences.

Griffin's photographs, while instantly readable, have a mysterious, almost indefinable quality. They give the feeling that different layers of meaning lie beneath their surface with more than a hint of other-worldliness. The viewer is left slightly uneasy and with an urge to keep looking at the pictures, to look 'inside' them.

'I want instant impact. That's where the power of photography lies. But there must be a subtlety behind this. I feel that photography breaks down if the image is right there—wham!—but with nothing

else behind it. Most of my pictures are meant to have an immediate effect but also to leave you feeling unsettled. I don't want to dictate. I want people to draw their own conclusions from them.'

Griffin did not at first consider his photographic interests as a route to a career. He started work as a nuclear power station estimating engineer for the British Steel Corporation 'measuring out reams of pipes day after day'. At the same time he pursued his interest in photography by attending the Hagley Camera Club near Stourbridge, Birmingham in England.

'Then one day, I suddenly realized that I couldn't stay in engineering any longer, and the only other thing I knew was how to take photographs. I had a camera of my own and I had some artistic inclination. So in 1969 I went out for a week and took hundreds of photographs. I put them into a Boots' portfolio,



David Bailey

Brian Griffin set out to photograph David Bailey and ended up at the end of the session as the main subject of what is also a striking David Bailey self-portrait

Chairs Taken in the empty ballroom of a hotel in Manchester. Griffin made a stack of some of the gold chairs, which actor Jeremy Irons used as his set

Man in middle Griffin photographed Len Murray, leader of the British union council, between two doors to symbolize a man working with both unions and government



Brian Griffin



The Ozalid executives *The lighting and arrangement of the figures is typical of the early work Griffin was doing for 'Management Today'*



Brian Griffin

applied to college and was accepted.'

Griffin immediately found that he had a fixation with light—the way it fell on objects, its intensity and its shape. 'I'd go out into a landscape and where light, like a shaft of sunlight, fell on a rock or wall, I'd expose for the rock. Everything else would be black. I remember that I was always doing landscape pictures where absolutely everything was black except for where the light was.'

In 1972, at the end of his student days, Griffin spent an intensive two weeks taking photographs, including some of the British Ballroom Dancing Championships. These formed the basis of his portfolio and, when he left college, he started what he thought was to be a long trek round magazines and advertising agencies looking for work.

Within four months, he had met Roland Schenk, Art Editor of the magazine *Management Today*. Impressed by the originality of Griffin's work, Schenk immediately gave him a series of commissions to photograph business men. One of these was to photograph the executives of a company called Ozalid which manufacturers specialist papers.

'I was given complete creative freedom. I took the executives along to the company's loading bay, and asked them to stand on the bay one metre above me. My flashgun was at shoe level and I used it as if it was a set of theatre footlights.

They look as if they are on stage, which was my intention. Many of the people I photographed hated my pictures. They thought they were sterile and unimaginative and the magazine received a number of letters to that effect, but Roland Schenk continued to commission me. He was really a kind of patron and mentor in my first few years'.

His early portraits of business men, in particular, are full of dark and dramatic imagery. He attributes this to being born and bred in a drab industrial area together with the fact that he had been influenced by the brooding, dark imagery of the films, paintings and literature of the 1920s and 1930s. Among these he selects the Hollywood fashion photographers who used mainly tungsten lighting and the German Expressionist films like *The Cabinet of Dr Caligari* and *Metropolis*. He says his treatment is now much lighter, both in his mental approach and lighting techniques.

'Looking back now, I can see that I was filled with a certain amount of antagonism towards management—a kind of naive venom. My images of them were very harsh and sometimes critical. In some ways it was a very ironic situation—I was supplying what was essentially subversive imagery to the magazine of British management, and they loved it and used it.'

On the strength of these portraits, Griffin was given commissions, especially by magazines, and began to build up a considerable reputation as a very original portrait photographer. He pre-

Lene Lovich One of a series of shots taken in a vast stainless steel beer tank for Lene's record cover. She wore several outfits for the session

Shoe shot A shaft of sunlight shining between two pillars makes this powerful image used on the cover of Joe Jackson's album 'Look Sharp'

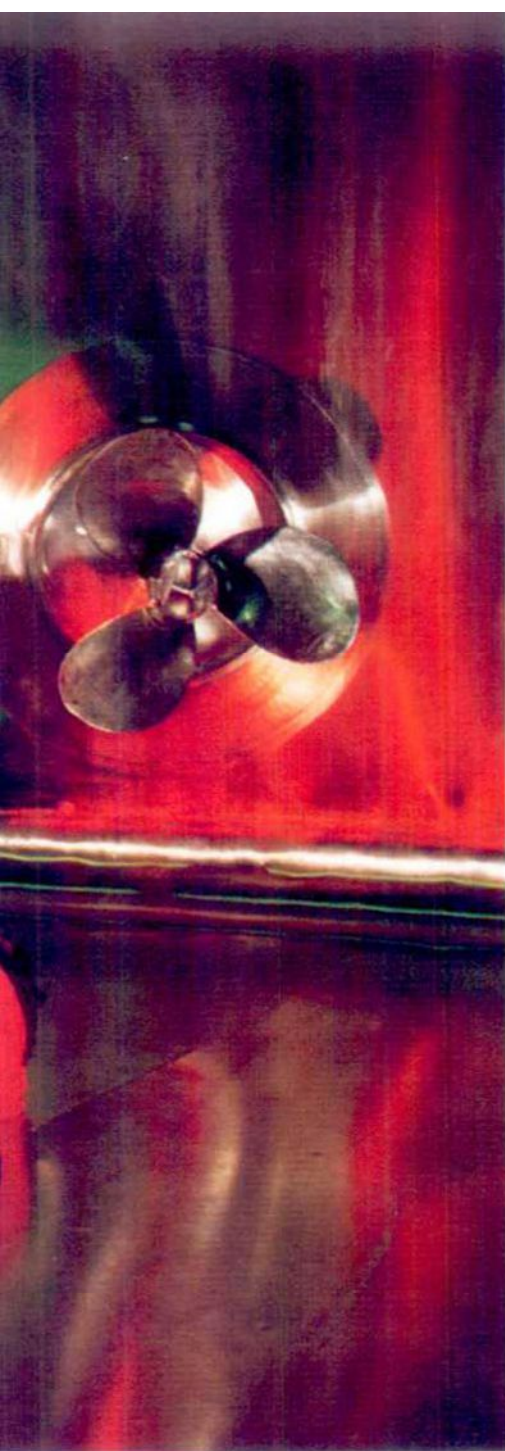
Brian Griffin



fers to work with individuals rather than groups because of his highly intuitive approach. He relies on having a rapport with his subject, and this is easier on a one-to-one basis.

His working methods are unusual: 'I work with light because light is energy and can evoke feelings in the viewer. I light an environment according to how I feel about the person I'm about to photograph. I don't want them to display to me physically how they feel about themselves. I use the light to echo my feelings about *them*, then put them into that light and see how they respond. I try to show inner emotions and feelings in an external way. I feel that some photographers have been too literal. They simply light people to get the right exposure. I think it's possible to illustrate a person's qualities graphically in a symbolic and indirect way.'

'I once had to photograph the writer, Marshall McLuhan. We were in this lecture room where there was a black-



Sir Alec Issigonis *The designer of the Mini car was photographed at his home near Birmingham holding a roll of technical drawings*

board with a spotlight shining against it. I stood him there and suddenly felt all this energy flowing from him. So I began to draw arrows all round him to indicate this energy. I think I was inspired by the painting of Saint Sebastian with the arrows going through him. McLuhan looked at me and said, 'I know what you're trying to do,' and he threw back his head and looked up at the spotlight with his arms behind him. I just went 'click'. We were in perfect harmony. I had recorded his energy and forcefulness.'

Not every assignment works out so well. Griffin was once commissioned by a prestigious Canadian magazine to photograph the golfer Gary Player. He was flown from London to Florida for the assignment but when he arrived he

found that Player knew nothing about it and had no desire to be photographed. After some negotiation, Player finally agreed to be photographed after the tournament.

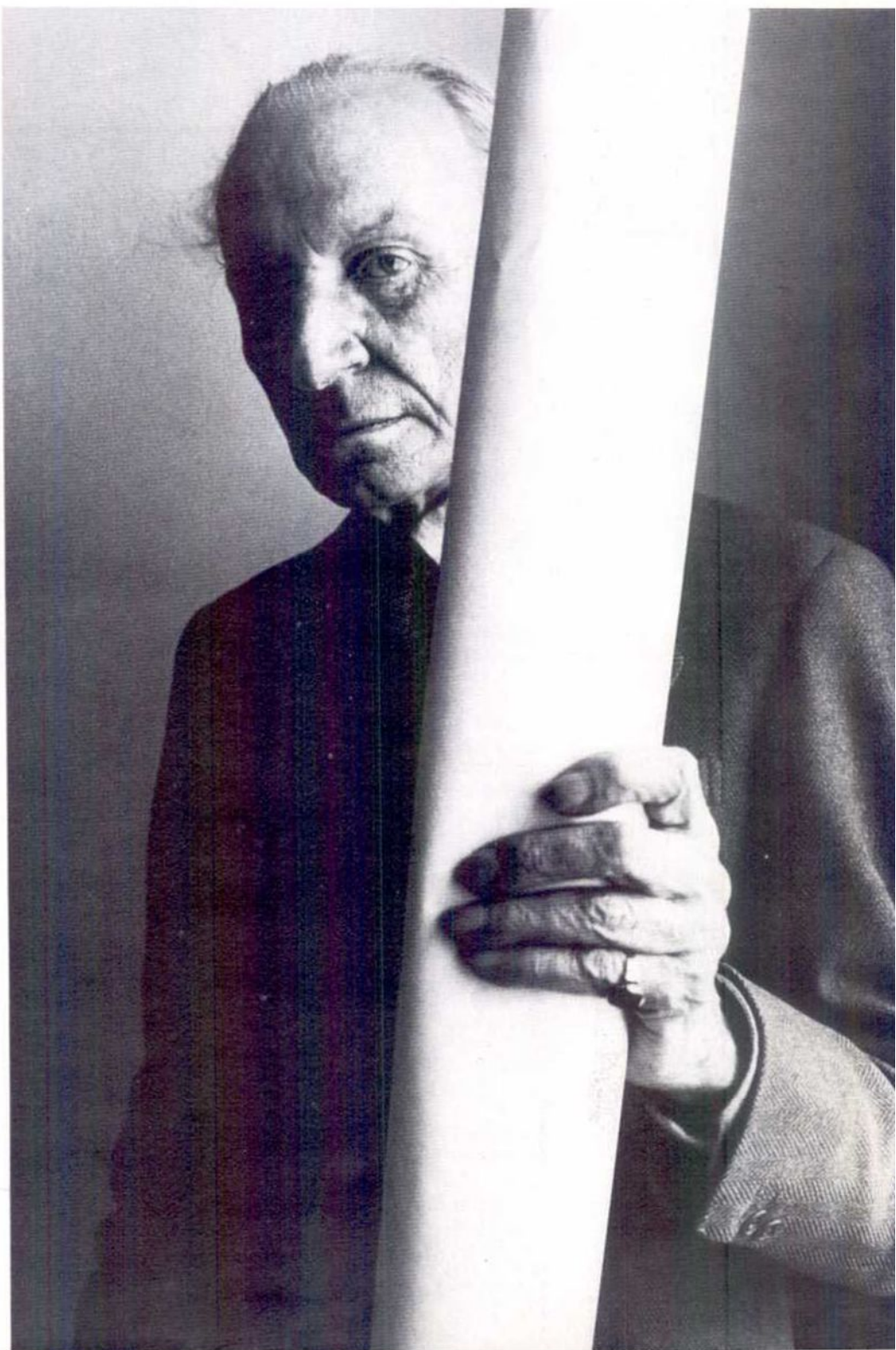
Griffin waited around all day for him to finish but at the end of the day, Player came up and said that he had had a terrible round of golf, he had just shut his finger in his car door, and that he could give him two minutes. Griffin took the shot in literally two minutes and flew back to London. Fortunately, occasions like this are rare.

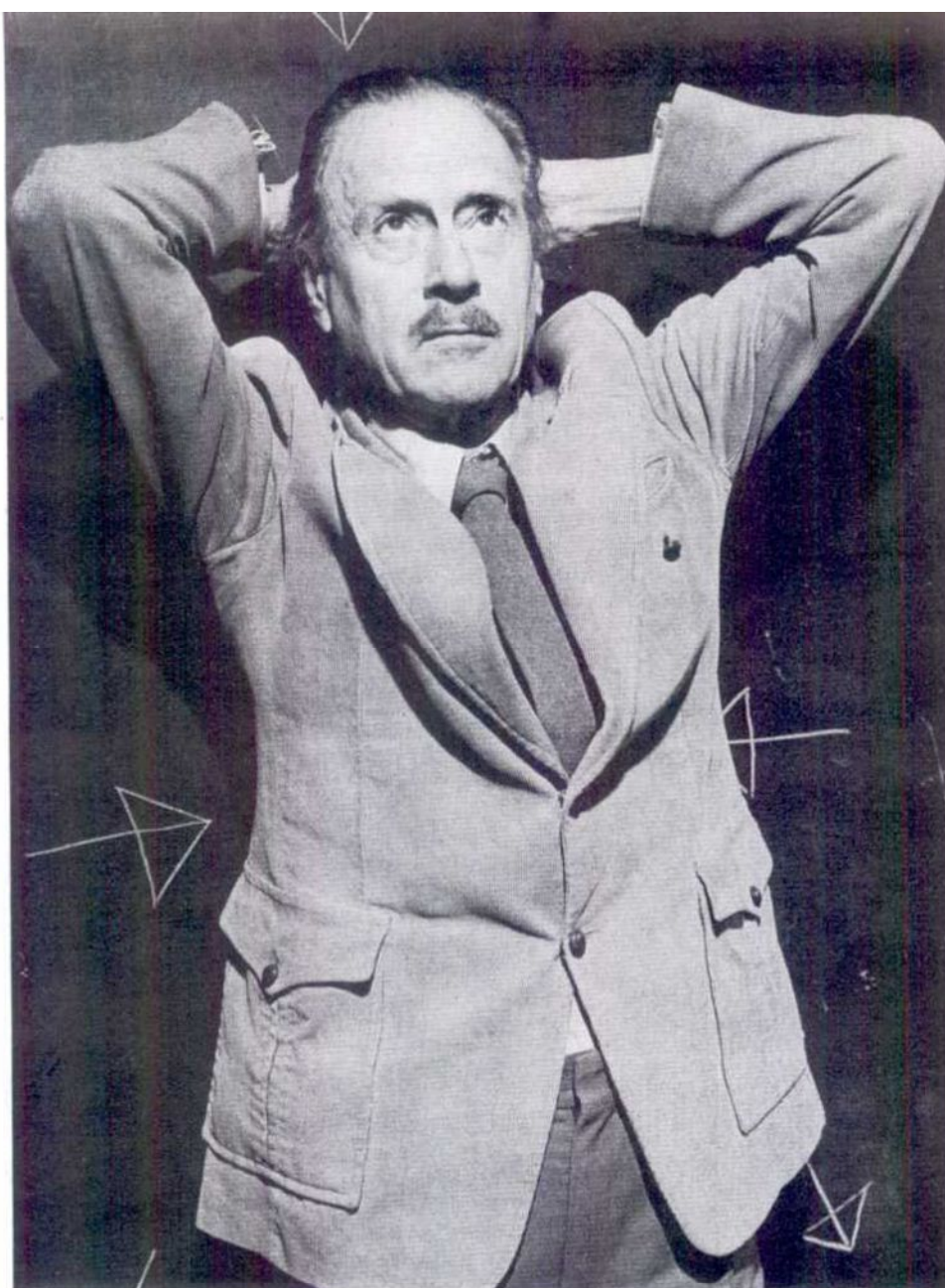
Griffin's photography began to develop along a new route in late 1977 when he began taking pictures of rock musicians for record albums. It was his first opportunity to photograph his

subjects in environments he had built himself. His love of the formally composed image had reached fulfilment as he could now be in almost complete artistic control of both subject and environment.

It was at this point that he started to use colour. 'The difference between black and white and colour photography is fascinating. No one sees in a black and white world, so to me it's a kind of dream world. Light is seen in its pure physical form—by its shape and intensity, but there is also another dimension—the colour itself. It is this link with the real world that makes colour photography so accessible.'

Despite these differences, Griffin approaches colour photography in the





Griffin now does a fair amount of advertising photography interspersed with his portraiture. He admits to not getting the same creative buzz out of this kind of work because basically he is working with someone else's ideas. The way a subject is to be treated is almost always totally decided before his involvement. However, he is realistic about these assignments. He is paid well for commercial commissions and this gives him the freedom to pursue other less commercial photographic interests, and to experience a different kind of photography.

'I did an advertisement for Rolls Royce. It was the most difficult shot I've had to light. The ad had to indicate that a business man was working late at the office. The location was a big office building with one lighted window. Light was cascading from the reception and flooding on to the Rolls Royce waiting in the car park. I had to light the building, the car park and the car.

'The main problem was that the car-park didn't have parking lines so we had

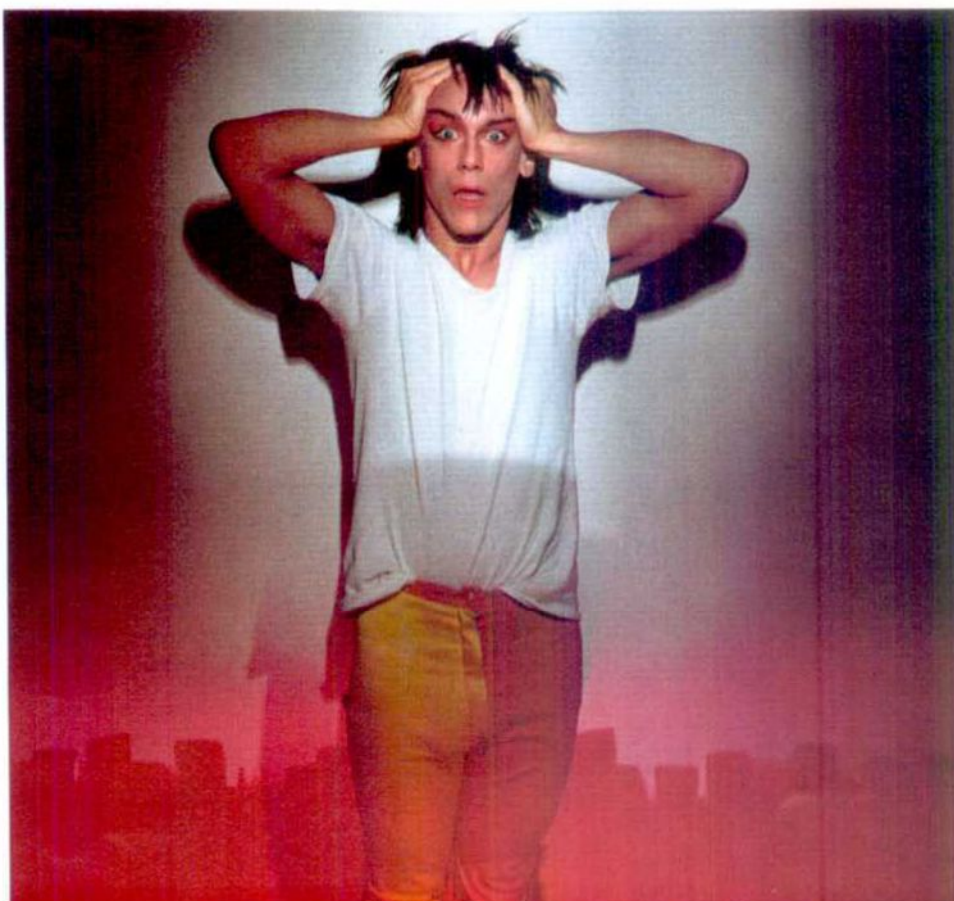
Marshall McLuhan Griffin photographed the writer against the blackboard in a lecture theatre. Griffin chalked the arrows on the blackboard to suggest an energy flow

Shoe manufacturer A portrait of Manolo Blahnik who runs a number of quality shoe stores. 'He put up his hand to shield his eyes from the bright lights and I took the shot'

Iggy Pop It is unusual for Griffin to be able to get to know his subject, but in this case he spent two weeks with the singer before taking the cover shots for his album 'Soldiers'

same idiosyncratic way that he approaches black and white photography. He never photographs his subject according to the colour it possesses, its inherent colour. He nearly always uses a white background which he then lights with different colours. He uses red when he wants a dynamic and exciting effect, and uses blue lighting to evoke coldness and stillness. Once again, he will try to judge the emotions and the personality of his subject before lighting his set.

'I was commissioned to do an album cover for Lene Lovich. She wanted to wear a bridal outfit and I felt that the flimsiness of her dress should be set against the hardness of steel for contrast. I got permission to use the Guinness Brewery in London where there was a vast stainless steel tank about 12 metres square. We got inside it, I used lots of strong white light to try to indicate her elusiveness. The green of the tank's fluorescent tubes gave an unearthly and ghostly feeling to the shot. Unfortunately it was very humid inside the tank. Although it was clean, we came out at the end of eight hours shooting sticky all over from the particles of Guinness floating in the air!'





to buy hundreds of feet of white tape to stick down. Unfortunately, just as we were going to lay down the lines, there was a terrific thunderstorm which made the ground so wet that the tape wouldn't stick. The shot went really well, but the lines had to be touched in afterwards!

'It was hard work and difficult technically. But I don't like standing still. The pressures of commercial photography mean that you have to keep testing yourself and pushing the frontiers forward.' He also cautions that by immersing yourself totally in commercial photography you can destroy yourself creatively. You become a technical virtuoso but cease to be in touch with yourself. Then the photographs lose freshness and spontaneity.

Griffin uses Hasselblad, Leica and Olympus OM1 cameras. Most of his photographs are taken on a 35 mm wide angle lens (on the Olympus and Leica) or its equivalent on the Hasselblad, the 60 mm lens. Although he occasionally uses a 50 mm lens he prefers the feeling of involvement that the wide-angle lens gives to a picture. It also offers a more interesting perspective without any real distortion. Griffin uses FP4 and HP5 black and white film, and Ektachrome 50 (tungsten), 64 (daylight), and Kodachrome 25 colour films.

Although Griffin's major source of income is from his commercial photography, he is also now gaining an increasing income from the sale of his photographic prints. These have been

purchased by a wide range of buyers from the collection of the Victoria and Albert museum and the British Arts Council to advertising agencies and private collectors. He is glad to be selling them but is also wary of only communicating with a narrow section of people who are already interested in photography.

'I want to communicate with a much wider audience. I want the everyday person in the street to get pleasure from my work. The album covers are a start in this direction, as are the five exhibitions I've been involved in and, of course, working in colour because it's so much more accessible. If the mums and dads and people who go to camera clubs like my work, I shall be happy.'

Budget studio flash

The versatility of amateur studio flash systems enables you to achieve professional results impossible with simple hand-held units

If you are planning to adapt a room in your home for use as a studio, you must give careful consideration to the lighting you buy. Since the greatest advantage of a studio is that you can create the conditions you want, the first requirement for studio lighting is that it should be as versatile and easy to control as possible.

Although you can sometimes use light from a window, this has the great drawback that you cannot control either the direction or the quality of the light. You have no control over timing, either, and you will often find that the light is lacking just when you want it most.

There are two ways of obtaining lighting as and when you need it—tungsten light and electronic flash. Each has its advantages and disadvantages.

Tungsten lighting is comparatively cheap and gives excellent results, but it can sometimes be unreliable, and the bulbs get uncomfortably hot. Electronic flash, on the other hand, can give good results if used off the camera and bounced, but it has the great disadvantage that you cannot see the quality of the light before taking the shot, forcing you to rely on experience or guesswork. As most electronic guns are of comparatively low power they are not suitable for repeated flashing into a diffuser or reflector and the batteries tend to run down very quickly.

Studio flash

The solution to these problems lies in flash which has been designed specially for use in the studio. Studio flash units are mains powered and have very short recycling times—between one and four seconds—with a ready light to show when the flash is ready to fire again.

One of the great advantages of studio flash units is that they always have built-in modelling lamps. These are mounted next to the flash head, and shine continuously, giving off a light whose directional properties are very similar to that of the actual flash unit. In this way you can see the effect of a given light combination.

Many modelling lamps are switched to suit the power output of the flash. The higher the flash setting, the brighter the modelling light. This is an invaluable feature, especially if you are using two units, because by switching off all other

Girl in red *Sophisticated, professional looking lighting arrangements are possible even with the most basic electronic studio flash units*



light sources you can adjust the light balance visually with the modelling lamps. The flash units then give out the light in the same proportion, giving the modelling you want.

Some units have a special device which switches off the modelling light just before the flash fires, and turns it on again afterwards. They also have a socket for a synchronization lead, allowing you to use them at any distance from the camera. Others include built in photocells or 'slave' units, which are connected to the circuit of the flash unit and trigger it off as soon as another unit is fired. In this way you can synchronize any number of flash units. Slave units can be bought separately and plugged into flash units which do not already have them built in.

Most flash units are built on the *monobloc* system, with the power pack and the flash head together in one unit. At one end there is the flash head with the modelling lamp, while the power socket, sync socket and the controls are at the other end. Most studio flash units can be combined with all kinds of accessories, so you can build up your own flash 'system', with facilities for controlling the light in many ways.

All manufacturers offer a range of accessories, designed to direct the light as required. Umbrellas are used for bouncing flash, and snoots have a similar effect to a spotlight, while honeycombs provide large areas of concentrated light. Barn doors are flaps which prevent light from going into unwanted areas.

Flash power and exposure

The power output of studio flash units varies from model to model, and in addition each one can generally be used at half power or quarter power. For a single unit, the exposure may be calculated using the guide number supplied by the manufacturer. However, when using umbrellas, diffusers or more than one flash head, these numbers become useless, because so many factors are involved.

Some manufacturers only give a power

Flashmeter

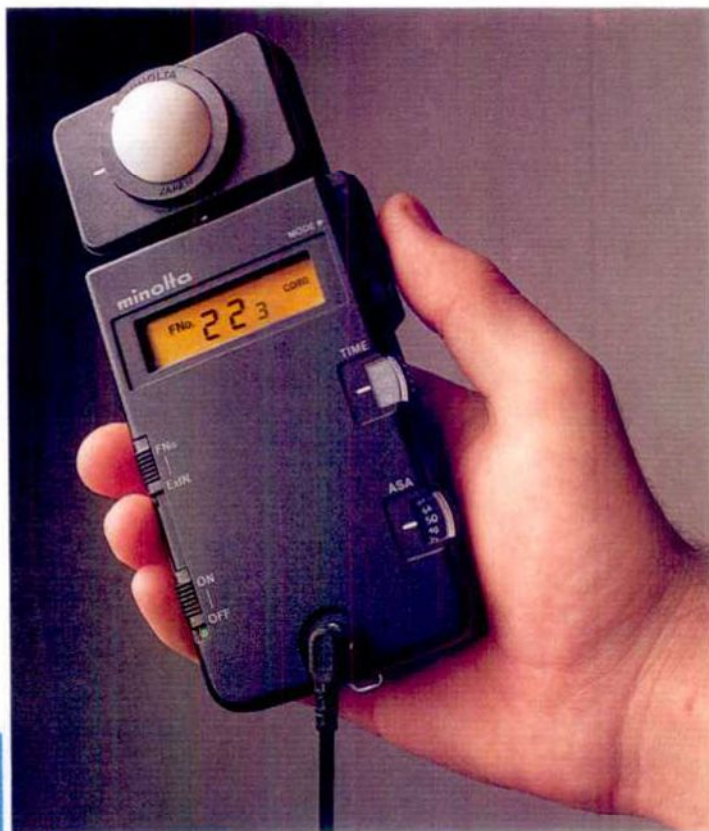
Manufacturers' recommendations cannot always give the accuracy needed for exposure and a proper flashmeter can be an invaluable extra. Unlike some, this Minolta meter gives a reading directly in f-stops.

Studio flash

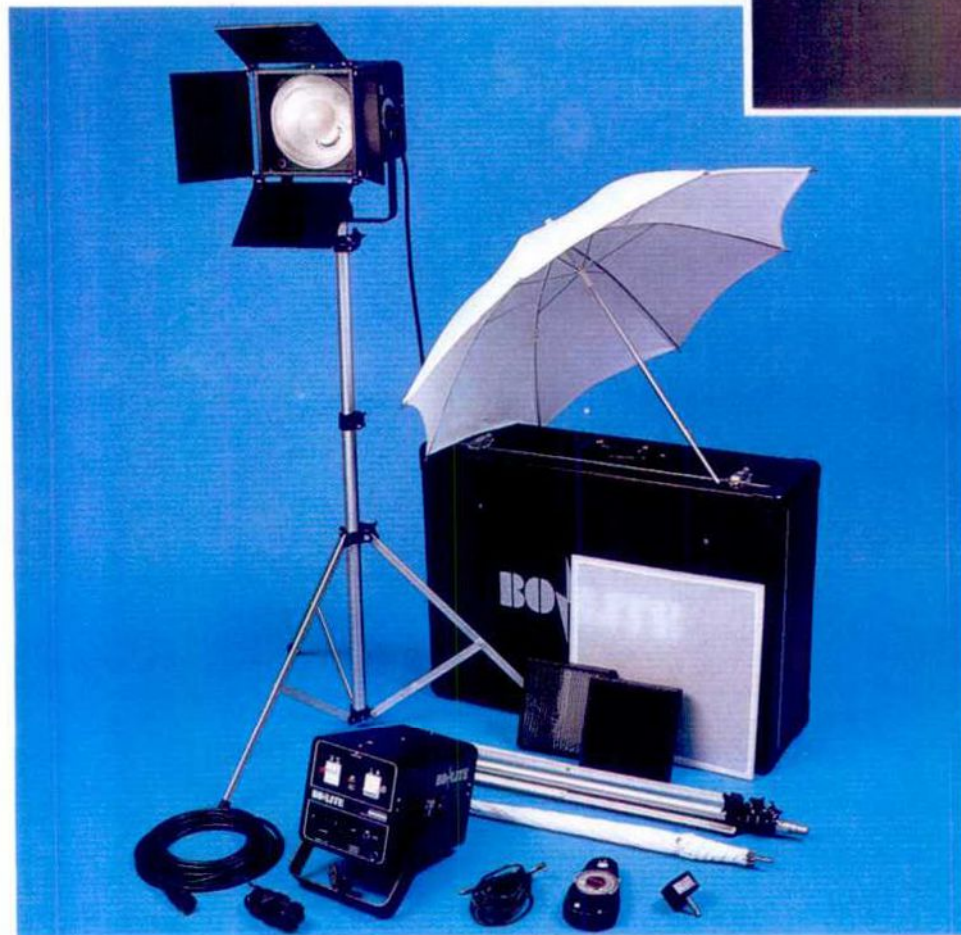
The Bows Bo-lite 200 is an inexpensive unit that comes with reflector and modelling lamp. A wide range of accessories is also available

rating for their units in joules or watt-seconds, and with these units you should follow the manufacturer's instructions for calculating exposure. (A joule is a unit of energy equivalent to one watt of power flowing for one second—the higher the joules or watt-seconds rating, the brighter the flash.)

The smaller units have a maximum output of 100 joules, while the more powerful ones go up to 500 joules, though this is far from the most powerful flash available as some professional units



Dave King



go up to 20,000 joules. All units have variable power output, an essential feature when you are using them for fill in or for close-ups, where full power would be too bright.

There is no simple conversion between joules and guide numbers. While the joule rating gives an indication of the overall power of the unit, it is of no use in calculating the exposure, as the light output depends on other factors. These include the type of reflector behind the flash tube, and the degree of spreading of the flash. In fact, a 127 joule unit from one manufacturer has a similar guide number to a 100 joule unit from another.

The only way to ensure completely reliable exposure calculation is to use a flashmeter. This device measures the brightness of the flash, and either gives you an index number which you then convert to an f-stop, or it gives you a direct f-stop readout. This is an essential piece of equipment to accompany studio flash, and well worth the extra expense.

Flash systems

There is a wide range of flash systems available, and your choice depends on the type of work they are intended for as

well as on how much you can afford.

At the inexpensive end of the scale, a unit such as the Bowens Bo-lite costs about three times as much as the average on-camera electronic flash, or about the same as a budget SLR. The Bo-lite has a built-in reflector and modelling lamp at one end, with clearly laid out controls at the other. Its power output is 100 joules, giving a flash factor of 33 (metres with 100 ASA (ISO) film).

The accessory kit consists of a four panel barn door, a silver and black honeycomb, and a 'softlite', which is a 36 cm square diffuser panel. All these attachments are easily fitted to the flash head, and the unit can also be used with an umbrella. All studio flash outfits require a sturdy lighting stand, and the Bo-lite can be bought as a complete kit which contains all you need for basic studio flash. This consists of a carrying case, two Bo-lites with stands, two umbrellas and other accessories, a slave cell and all the necessary leads.

Another low priced system is the Courtenay Colorflash 2 and 4 series. The Colorflash 2 has a similar power output to the Bo-lite, giving a guide number of 27 to 34 with 100 ASA film. The Colorflash 4 is more powerful, with a guide number of 38 to 46 with 100 ASA film. Courtenay also supply a full range of accessories, all of which can be fitted in their specially built carrying case.

More expensive are units such as the Multiblitz Mini Studio 202, which has an output of 200 joules and a recycling time of 2 seconds at full power and only 1½ seconds at half power. The accessories

are fundamentally the same as those for the other makes mentioned, namely a soft box or diffuser, honeycomb, reflectors and umbrellas. The 202 system can be bought as a complete kit, with three heads, lighting stands and accessories, all in a compact carrying case. The flash heads have built-in slave cells.

Another system, the Multiblitz Profilite system, combines the advantages of both portable and studio flash, constituting a multi-role system suitable for both studio and location work. The unit consists of a power pack, flash head and power source adaptor. The essential feature of this system is that it can be used as a portable flash when fitted with a battery pack and a flash head without a



Studio flash systems Like the Bo-lite the Courtenay Colorflash (above) is an inexpensive unit with a power output of 100 joules giving a guide number (in metres) of around 30 with 100 ASA film. The Multiblitz Mini Studio 202 (left) gives twice the power and recycles rapidly, but costs a little more. The sophisticated Bowens Monolite system (right) is even more expensive, but it can be built up gradually rather than purchased outright

modelling light. Alternatively, it can be used as a studio lighting system when the flash head is changed for one with a modelling lamp, and a mains adaptor attached. There is even an adaptor available which allows the unit to be



George Wright/equipment courtesy Keith Johnson Photographic

powered by a car battery, and the full range of accessories is available, including a carrying case.

Among the more sophisticated units is the Bowens Monolite series. The Monolites are cylindrical monobloc units with built in modelling lights. These are switched on in proportion to the flash power output. There is also a control for switching the modelling lamp to full brightness, which is very useful when focusing, and a device which extinguishes the modelling light as the flash fires, switching it on afterwards. The Monolite 200 E has a rating of 127 joules and a guide number of 34 with 100 ASA film.

A more powerful version, the Monolite 400 E, gives a maximum power of 254 joules, and a guide number of 50 m with 100 ASA film. Top of the range is the Monolite 800 E, with a power output of 508 joules, and a guide number of 67 m with 100 ASA film. This model also has a recycling time of $1\frac{1}{2}$ seconds and a four power output selector.

The Monolites have sockets for flash

On the bench Some systems can be used outdoors as well as in the studio—the Profilita runs off a normal 12 volt car battery

slave cells, and an overheat cutout device. The accessories available form a very comprehensive range, and there are a variety of reflectors and devices for controlling light. The stands available run from lightweight to heavyweight, with a boom type stand also available.

Similar to the Monolites is the Courtenay Sola studio flash. There are three models in this range—the Sola 2, the Sola 4 and the Sola 8, giving guide numbers identical to the Monolite units.

Choosing a system

The first thing you must consider when you buy studio flash is the power output you are likely to need. If, for example, you only intend to shoot close-ups or head and shoulder portraits on fast or medium speed film, then an ordinary amateur flash or one of the less powerful studio units, say one with 100 joules output, should be quite adequate for your needs. On the other hand, if you want to photograph groups, then you need a much more powerful unit. It is better to buy more power than you need than to buy less, because you can always turn a unit down if necessary, but you cannot increase its maximum power output.

The number of accessories you buy depends on the amount of work you intend to do, as well as on the type. The range of accessories is vast, and not all of them are essential, at least at first, while others can be improvised. An umbrella is probably the most useful item, but diffusing screens can be made with tracing paper, while you could make snoots from heavy black paper or card.

Bear in mind that the more accessories you buy, the heavier the equipment will be, and it can become very troublesome to carry around. If you do not intend to move about too much, this is not too important, but you should still avoid buying items you do not really need. The best method is probably to build your system up slowly, starting with essentials and adding things you need one at a time.

You might also try looking at what is available on the secondhand market, as a system in good condition might be much cheaper than a new system, and is certainly an alternative worth considering if you are working on a budget.

Although not all the units described are as powerful as some of the more expensive hand held guns, and they are also much more cumbersome to use, the advantages far outweigh the disadvantages if you intend to do studio work at all seriously. The control you can achieve over the direction and quality of the light gives you a far wider range of possible modelling effects.

For a photographer who plans to do studio work regularly, a studio flash system is essential equipment. If you decide that studio work is for you, then you must decide what power output you require, and base your choice on this consideration. If you choose the right studio flash system, it should prove to be a very worthwhile investment.



Kim Sayer/equipment courtesy Bowens



Improve your technique



Shots against the light

When a light source and the scene it illuminates both appear in a picture, the capabilities of film, lens and photographer are stretched to the limit—but the final image can be brilliant

You still sometimes hear people reminding photographers that they have not got the sun behind them. At one time, when snapshot cameras and lenses were very limited, this was a necessary precaution for successful pictures. But thanks to mass production and lens multicoating, even quite cheap cameras can take bright sparkling pictures in which the sun, or another light source, appears. Nevertheless, photographers still hesitate before pointing their cameras towards a bright light. Those that do rarely regret it, because *contre jour* lighting can be the making of a picture.

Taking pictures into the light, though, is not as straightforward as photographing with the light behind you. Exposure meters are easily misled by the high contrasts, and extra care must be taken to avoid flare. On the other hand, provided you understand what the problems are, and how to overcome them, you should not find it difficult to photograph even when the light shines directly into the lens.

How to avoid flare

The main problem in photographing a bright light source is that the brilliant rays of light have to pass through several layers of glass, with air gaps in between them, and past various metal and plastic surfaces, before finally reaching the film. Reflections and light scattering can take place anywhere along the way, and any part of the scattered light that eventually reaches the film no longer forms a focused image of the subject, but instead causes flare.

The most noticeable form of flare is that which results from strong reflections from one or two surfaces only. This kind of flare forms a strong flare spot or patch on the film, often in the shape of the diaphragm opening. It is also possible to see ghost images of the light source itself, on the opposite side of the frame.

The other form of flare is less immediately obvious. This is general flare over the whole image area which effectively gives a low level fogging exposure to the film. The main effect of this type of

flare is a reduction in contrast and brilliance. On colour film it reduces colour saturation, and imparts a misty, veiled atmosphere to the scene.

Further trouble from flare can arise even when powerful light rays have left the rear elements of the lens. Reflections can occur on the film, too, and these take two forms. First there is *halation* which is caused by light passing through the emulsion, striking the film base and being reflected back into the emulsion to form a secondary image. Since the reflected rays do not follow the same path as the original ray, the image spreads out. Modern films have very efficient antihalation bases, though, and this particular effect is only visible when very bright light sources appear in the picture.

The other effect within the film is a form of diffusion. Light rays striking the silver halide grains are reflected on to other grains not directly illuminated. Again the result is spreading out of the image so that bright highlights are not

Sunlit silhouette *Exposing for the sky and sun reduces subjects in shadow to a stark black outline*

Black car *One or two stops extra exposure is needed if a light source is visible—a TTL meter is easily misled*

sharp and hard edged on the film, but rather blurred and soft.

In most cases where a photographer points a camera into the light, elimination of flare is of paramount importance. The antireflection coating on modern lenses helps in this respect, but there are other precautions which you can take to cut flare even further.

The first of these is to use as uncomplicated a lens as you can while retaining quality. Since light scattering takes place at each air-glass interface, the fewer of these there are, the less of a problem flare is likely to be. Zoom lens designs, by their very nature, are complicated, so never use a zoom lens for shooting into the light if you can avoid it—unless you are deliberately trying to emphasize flare for creative reasons. Standard lenses are usually comparatively flare free, as are the majority of good quality telephoto lenses. Wide angles, particularly recent designs, are quite complex, and are prone to flare.

One of the simplest precautions that you can take to minimize flare is to make sure that you have a clean lens. Although overfrequent and vigorous lens cleaning



Robin Laurance

can lead to scratching of the lens surfaces, occasional careful cleaning causes no damage, and is a necessity for flare free pictures.

Do not just wipe the front element with a handkerchief or shirt tail, but remove dust and grit methodically. First remove any surface dirt with a soft brush. This prevents grit from being ground into the glass when the lens is wiped. If the glass

is still dirty, take an ordinary paper handkerchief, fold it in half four times, then tear the folded wad into two. Use the torn ends to clean the lens, wiping marks off in a circular motion, starting in the centre and working outwards. Finally, remove any fluff with a brush.

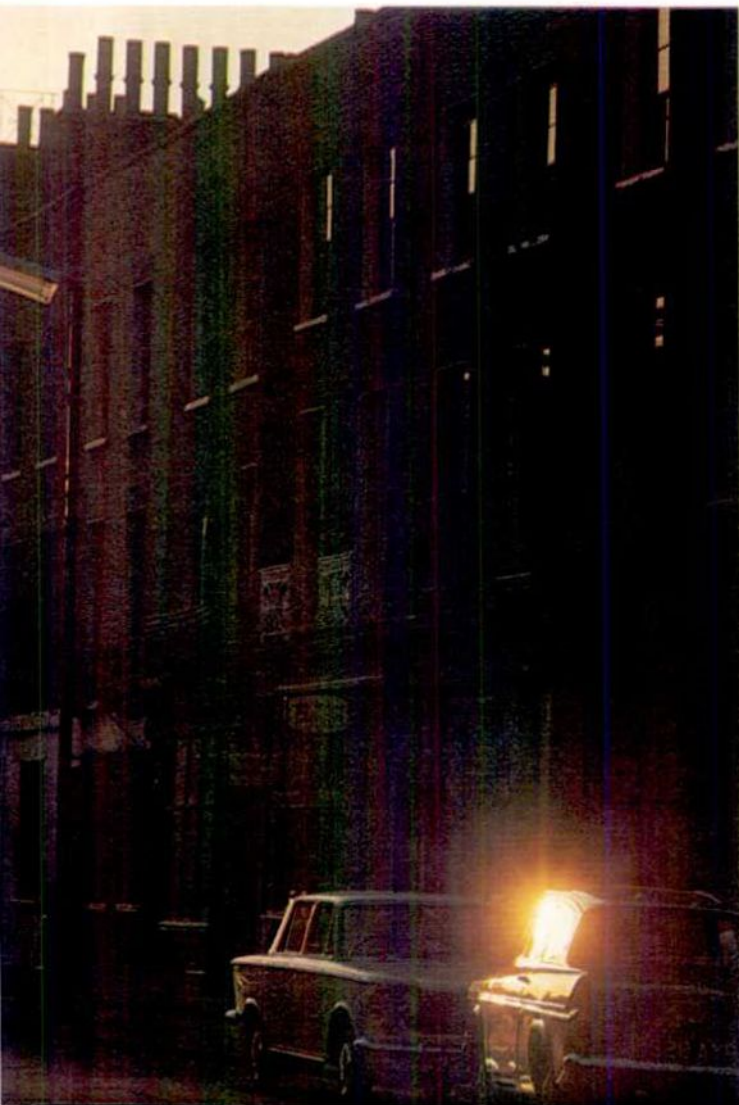
Really stubborn marks, such as greasy fingerprints, can be removed by breathing gently on the lens, then wiping with a tissue. Remember to clean the rear element of the lens, too.

Flare is encouraged by using a filter or any other front-of-lens accessory except a lens hood. If you normally use a skylight filter to protect your lens, remove this when shooting into the light. If you really must use a filter for some reason, use the best quality you can find, preferably a glass filter that is antireflection coated. Avoid using plastic filters—these are never coated—and never use more than one filter at a time.

The aperture to which the lens is set

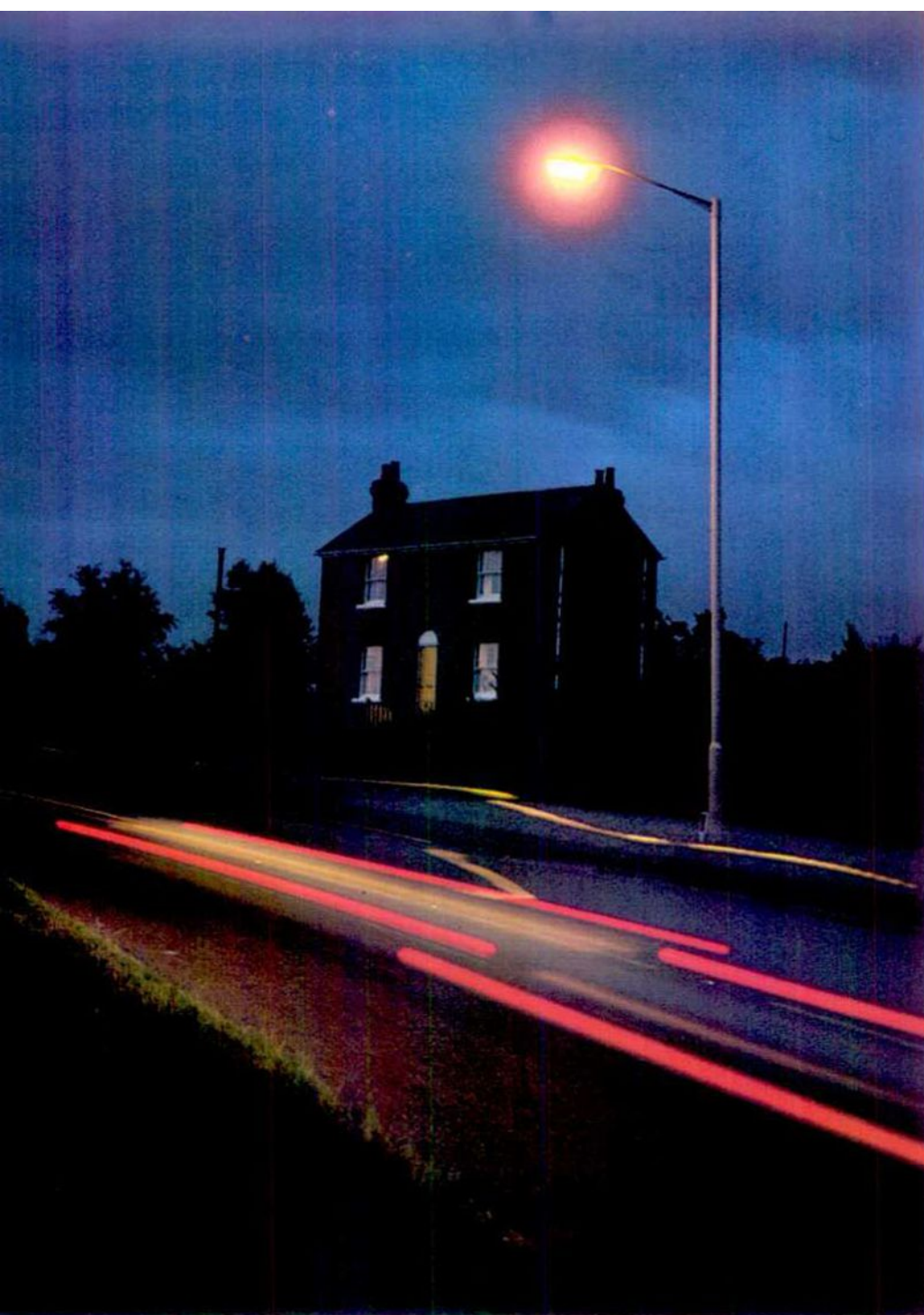
Reflected glow
Deliberate underexposure can make a good picture from a dull subject

Roadside view
Backlighting can cause flare that softens the image, and cuts down contrast



Sally & Richard Greenhill





Sometimes, particularly when photographing a sunset in which the sun is quite bright, a ghost image of the sun appears in a particularly undesirable part of the picture. It may be possible to deal with this by altering the composition so that the ghost image coincides with another bright part of the picture, such as a reflection on water. Alternatively, you may find that all you can do is to place the sun at the centre of the picture, so that its ghost image coincides with its real image. This sometimes produces a ring of light centred on the sun, however.

Getting the exposure right

When a light source appears in a picture, the tonal range of the scene—the subject contrast—becomes many times higher than usual. The sun, for example, is 100,000 times brighter than the most brilliant highlight in the scene it illuminates.

This exposure range is far greater than any film can handle, and the inevitable result is that the light source, when it appears in a picture, is overexposed. What you as the photographer must decide, though, is how much overexposure of the light source is acceptable. This varies from picture to picture, according to how much detail is required in the other parts of the photograph. If you are taking a backlit portrait, for example, in which the sun appears over the shoulder of the model, detail in the sitter's face is important, so exposing for the sun is out of the question. On the other hand, in a street scene at night, the light sources themselves and their immediate surroundings—the street lights, car headlights and brightly lit

Headlight trails To prevent flare in night pictures, carefully clean your lens, and avoid the use of a zoom

Music lesson Fill-in flash helps to put light into the shadows when the main light is behind the subject

also has an effect on flare. At a wide aperture, marginal rays entering the lens are more likely to strike the edges of the lens elements, causing the light to scatter. Even stopping a lens down half a stop from its maximum aperture can eliminate this source of flare. On the other hand, once the lens is stopped down to a very small aperture flare again begins to increase, because light is scattered by the blades of the diaphragm.

Some flare patterns can be subtle, and may not be noticeable on the camera's viewing screen, which has rather low contrast. When you see the result, however, you may find that the flare is now only too obvious, thanks to the higher contrast of slide film in particular. One way to check for such hidden flare is to move the camera slightly, so that the flare pattern will change its position. This may make it easier to spot, and you may be able to avoid it altogether by stopping down further.



Peter Loughran

Sally & Richard Greenhill



Robin Bath

windows—may be the only parts of the subject that are bright enough to appear on film. Here, shadow detail usually disappears completely, so overexposure of the light sources is not so acceptable—they make up the principal subject.

Each individual case must be judged on its own merits. Think carefully about which part of the picture constitutes the main point of interest—are you trying to take a photograph of the light source itself, or is the area that it illuminates more important? The TTL meter in a camera generally indicates an exposure which records a plain subject as an even mid tone on the film. To measure the exposure, then, you must first decide which part of the subject is to appear as a mid tone, and take a selective meter reading from that part.

In the case of the backlit portrait, mentioned above, the model's face is the area which is to appear as a mid tone. Though this is in shadow, it is the area from which you must take a meter reading. The sun is still included in the picture but in this case, it forms a burned out area of overexposure.

For the night scene, the situation is different. Here, the important parts of the picture are the light sources and the areas around them, so your meter reading should concentrate on these parts of the picture and not on the shadows. A reading taken from the roof of a car parked under a street lamp should suggest an appropriate exposure.

If you have an automatic camera, key tone readings like this may be quite difficult. If possible, use the camera manually, or use the memory lock button if your camera is fitted with one. A straight reading taken in the normal way will almost certainly lead to underexposure when a bright light source is in the picture, unless it is balanced by an equivalent amount of deep shadow, so if you have neither manual control nor a memory lock, you may be able to get the correct exposure by using the backlight button or exposure compensation dial, which should be set to $\times 4$, or $+2$. Alternatively, reset the ASA dial to a lower film speed—this will also result in extra exposure. As a further precaution against incorrect exposure, try and bracket your pictures if you can, by making exposures at one stop above and below that recommended by the meter.

The problems that crop up when a light source appears in the picture are very similar to those encountered when lighting comes from behind the subject or from one side. The harsh contrast that this sort of lighting generates can be reduced by using fill-in flash, or a reflector to put light into the shadows.

Using flare creatively

It is not always necessary to totally eliminate flare, and sometimes it can be used to brighten up a dull picture. The two different types of flare—general veiling flare and octagonal diaphragm

Sun and flowers Octagonal flare spots need not spoil your picture. In this image they echo the drops on the leaves

spots can be generated in different ways, and each gives quite a different kind of feel to the picture. Veiling flare conjures up a misty, romantic mood, but brightly coloured flare spots give an impression of dynamism, and a modern, active look.

Veiling flare is only too easy to produce. Pastel and soft focus filters rely on it for their effect, but there are simpler, cheaper ways of introducing it. Lining a lens hood with crumpled metal foil is a sure way of doing this—pieces of gauze or crumpled cellophane partly covering the lens are equally effective. Try breathing on the lens in cold weather. Though this requires no extra equipment, it is rather unpredictable. Using a zoom lens at full aperture is a sure way of generating flare when the light source is visible in the picture.

Flare spots are slightly more difficult to control. Set the lens to its minimum aperture, and press the stopdown button on your camera. If you then point the camera at the light source, flare patterns are usually clearly visible, but their position in the frame depends on that of the light source itself. Getting the string of colourful octagons where you want it may not be as easy as it seems. They show up best where they cross an area of shadow, and can be almost invisible on highlight areas.

Nature walk

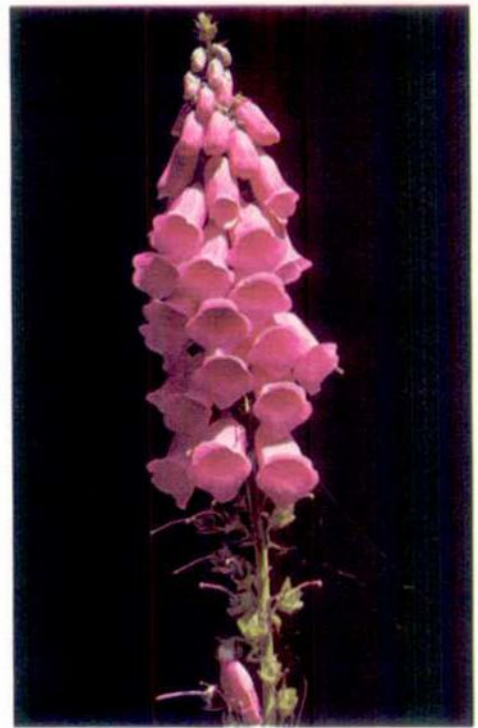
Walking in the country with a camera is a popular pastime. We accompanied Colin Molyneux, the noted landscape photographer, on a walk in the Welsh hills

Colin Molyneux lives in Wales, about 25 km from the hills of the Brecon Beacons. This area contrasts greatly with the East Anglian coastline, where Trevor Wood, a great friend of Colin's, photographed aspects of the coastline (see pages 806 to 809), so it is interesting to compare the two photographers' approach to the subject.

Colin made no concessions to port-

ability as he set out. He had a Nikon F3 body with motor drive, an 80-200 zoom, four other lenses and a wide assortment of meters, filters, viewfinders and other accessories, including a compass. In addition he carried a sturdy tripod, which he used for most of his shots. 'I can't hold the camera still otherwise', he joked.

The film he chose was Kodachrome 64,



Bark A fallen tree, which the casual walker might overlook, offered endless possibilities for studies of shape and texture. **Foxglove** Colin's 200 mm macro lens allowed him to choose a completely black forest background. **Woodland avenue** The incident light meter gave 4 seconds at f/8, but Colin finds that low light readings are often unreliable so he gave exposures of 5, 10, 20 and 30 seconds at f/11. There was little to choose between the 5 and 10 second exposures, but the 10 second shot, shown here, gave the best results





Long shot This overall view of the area has simple shapes, but includes plenty of interest in the variegated greens of the trees. **Waterfall** Colin experimented with different exposure times. For this effect he gave a 5 sec exposure using a neutral density filter to avoid overexposure. **Ferns** Patterns feature in this 200 mm shot



which he uses wherever possible. 'I have great arguments with Trevor Wood over the relative merits of Kodachrome and Ektachrome,' he said. 'I don't like the Ektachrome blue.'

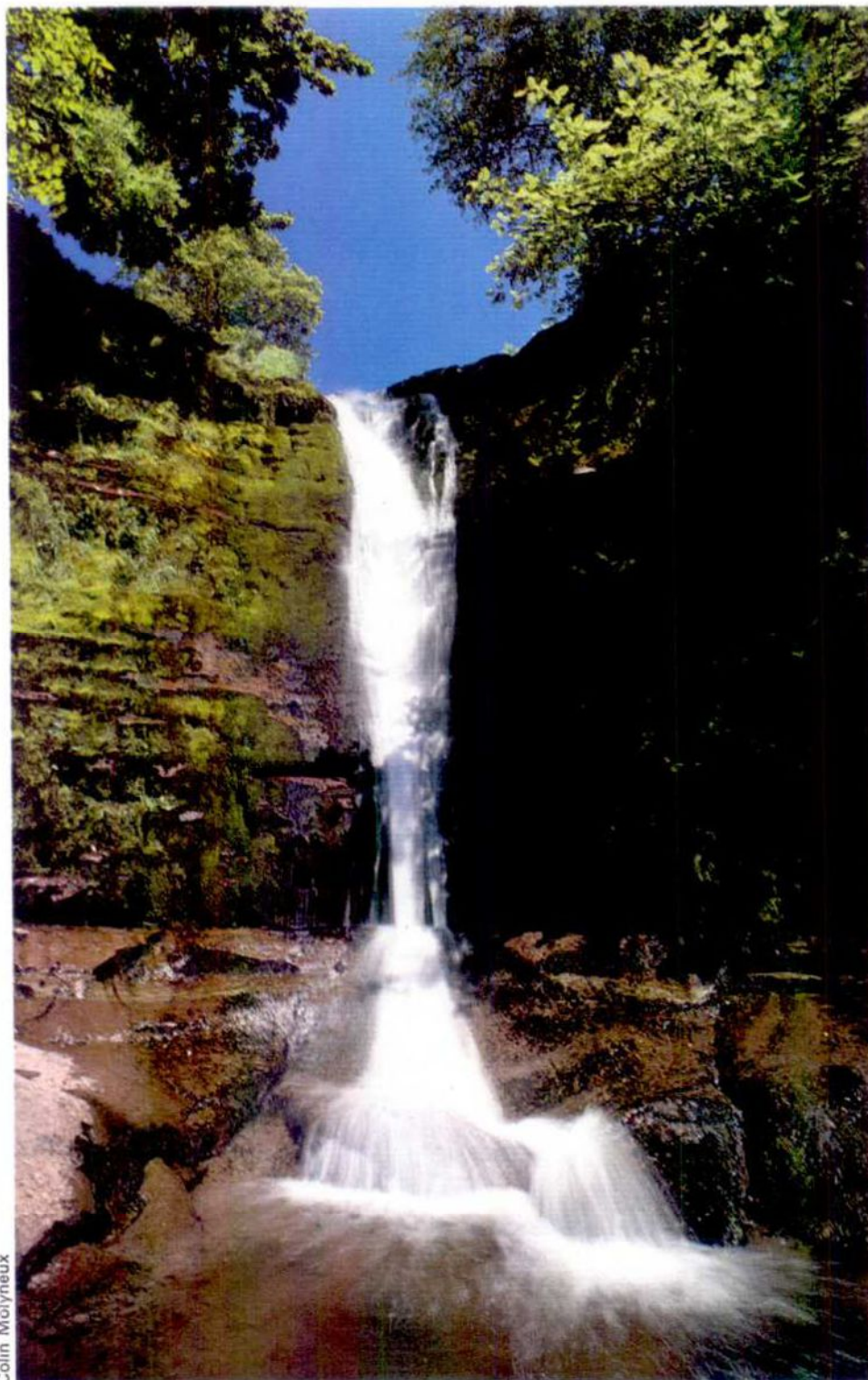
Most of Colin's lenses are fitted with a Nikon R2 filter, which is equivalent to a Wratten 81A, rather than the more standard UV or skylight filter. This filter gives tones a slightly warmer colour, and helps correct any tendency to blueness in shadows or on cloudy days.

He also has a selection of Cokin graduated filters. 'The pink ones help to salvage shots that look bloody awful, and the grey ones reduce contrast when there's a landscape with a bright sky.'

As we entered a glade brilliant with foxgloves, Colin set up his tripod to frame carefully on a bloom with a delicate cobweb, seen against a dark woodland background. As soon as he had done so, the sun went in. 'Why anyone wants to take up photography



Robin Scagell



Colin Moynaux

The photographer Colin uses a tripod for nearly all his shots. Here he focuses on a stone wall with a 55 mm macro lens. **Droplets** These form as the water topples over the lip of the fall. 1/500 second was needed on the 200 mm macro lens at its full aperture of f/4. **The falls** At the other extreme, Colin used a 20 mm lens with a polarizer to darken the sky in this dramatic view

for a living beats me' he said as a cloud blotted out the sun for 20 minutes in an otherwise clear sky.

Why do landscape photographers concentrate so much on details of the landscape? 'You can say a lot with a close-up. Perhaps because I began as a graphic designer I admire simplicity. There's nothing wrong with pretty long shots, but they must be good artistically. They can get very cluttered—telegraph poles are the bane of my life.'

'It's the little things that interest me, that others might overlook, like the way those ferns cling to the rock. I love stone walls, too.'

He uses his 80-200 Nikkor zoom a great deal for composing his shots. 'It's heavy, but it's a useful lens—I can get just the composition I want.'

When he began taking shots, the motor drive whirled three or four times whenever he pressed the button. A motor drive for photographing landscapes? 'I use it through force of habit—I used to miss a lot of shots through not being wound on and ready. I tend to use a lot more film, but at least there's a better chance of not having a shot spoiled by one of Kodak's blue spots in the processing!'

During the day the subject matter and the light varied greatly in contrast. Colin uses an incident light meter but checks its reading with the camera's TTL meter. In overall flat light, he finds there is little difference between them. But in contrasting light the two readings often differ widely, so he brackets the exposures between the two.

Colin's results show how a wide and interesting range of shots can be taken within a fairly small area, by looking closely at the features the landscape has to offer and by taking care over every detail in the scene.



Coach work

The photographer's imagination is as important a factor as the subject itself in creating exciting images—more so if the material is unusual or rather individual

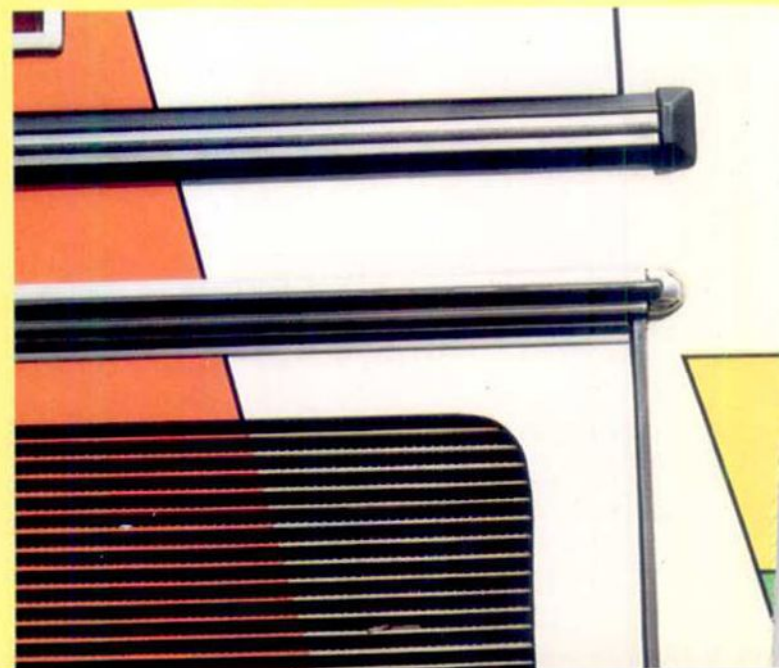
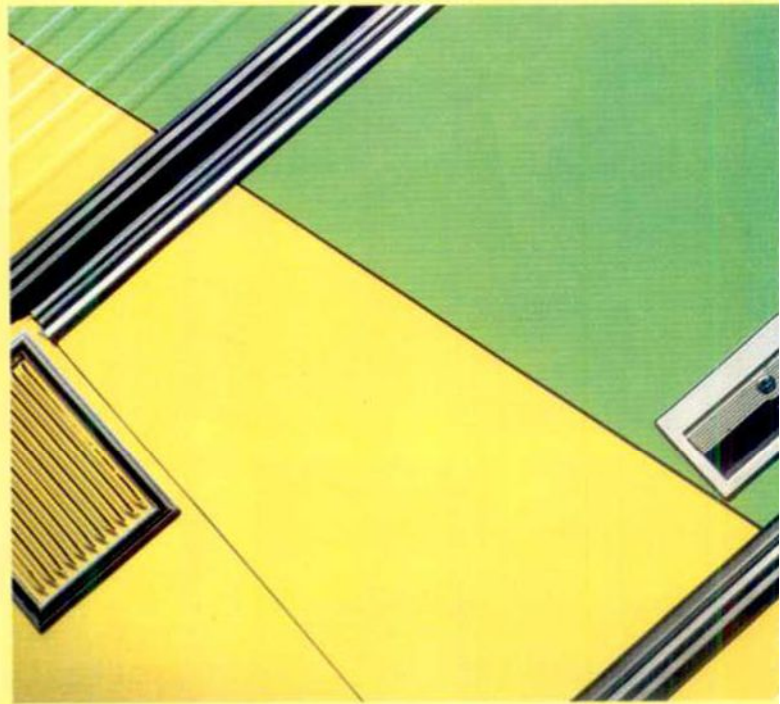
Details of ordinary commercial coaches may at first seem to be an obscure subject for an assignment. But if, like Ian McKinnell, you have a taste for more unorthodox compositions, for bright colour and hard shapes, then you may find that subjects like this are ideally suited to your interests.

Ian is constantly on the lookout for brightly coloured features in the urban landscape. A visit to Paris provided an excellent opportunity to make a study of the details of the paintwork on the many buses and coaches which converge on the French capital from all parts of Europe. But similar studies can be attempted almost anywhere. All the photographer needs is a sense of graphic design and a keen eye.

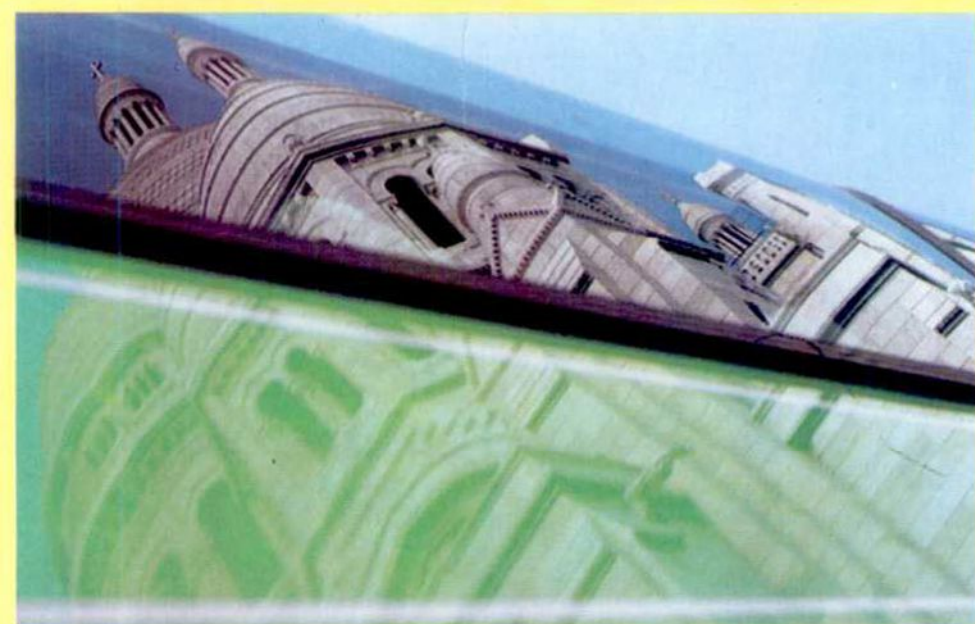
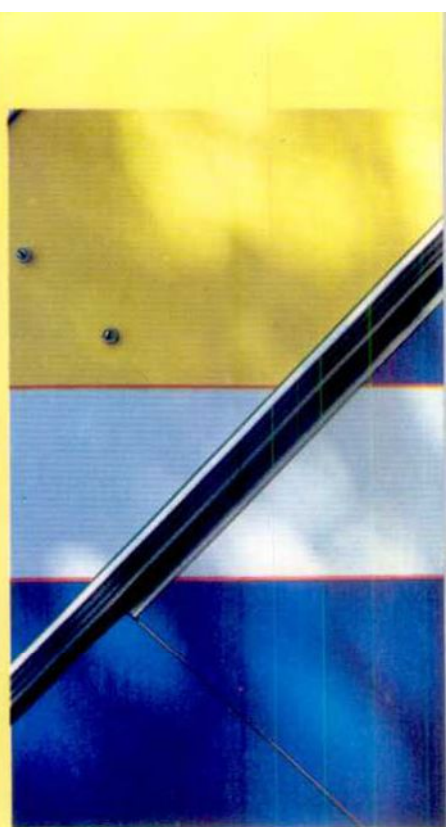
For this assignment Ian's main interest

was in taking close-up studies of the paintwork but he also tried other approaches—full views of the vehicles and shots of them in relation to their place and role on the road. These wider views were less successful—mainly because there was too much going on in the frame, or because, as Ian explained, 'People or city scenes added extra elements which detracted from my initial aim and the compositions became clumsy and messy.'

Night light Ian decided a night shot would make a coach look more striking. A 15 second exposure made the car's lights streak across the foreground, adding colour and a feeling of movement. **Closer view** A 200 mm lens was used to isolate this graphic, abstract detail (left)



Photographs by Ian McKinnell



This 'initial aim' that Ian refers to does not really involve an attempt to actually produce photographs of coaches as they usually appear. His approach mainly involves using the coaches as props for a particular style of picture. Coachwork colours and the designs are all highly suited to an interest in graphics and to techniques like holding the camera at an angle or isolating a small detail so that the viewer is unable to see it in its usual context.

The subjects Ian chooses are usually static, allowing him plenty of time to choose his viewpoint and to take great care over the composition. Nevertheless, he sometimes finds that he has to work quickly if an interesting coach suddenly appears. To make the most of the bright colours, Ian tries to avoid working in shadowed areas. As he explains, 'to get the intensity and saturation of colour, together with the

sharp delineation of shapes and shadows I need, it is far better to work in bright sunshine.'

One of the techniques used for some photographs in this series was to angle the camera relative to the surface of the coachwork and to use a wide angle lens at a small aperture to keep the whole frame sharp. This distorts the apparent perspective of the design and produces a more individual or abstract image.

Exposure is critical for photographs which concentrate on shape and colour—especially if there are large areas of white or light-coloured areas which would make a straight exposure reading yield a dark, very underexposed photo. To overcome this, Ian normally takes a meter reading from a grey card or from a flat grey-toned area, such as the road surface. This reading forms his basic exposure but he always brackets his shots either side of it.

A A straight wide angle view of the coach lacks interest—moving in closer gives a more interesting image. **B** Here the shape of a wheel has been juxtaposed with the strong straight lines of the coachwork. **C** By tilting the camera at an angle the image gains impact from the strong diagonal and the bold division of colour. **D** The grille and the chrome trim supplements the painted designs. **E** Carefully framing a coach against a familiar setting leads to a different type of shot. **F** Here, the reflections of the city lights give an attractive effect. **G** Mixed diagonals and horizontals, together with the divisions of colour they produce, are typical of Ian's approach. **H** An unusual viewpoint and the reflection of Sacré Coeur create an individualistic image. **I** Even a familiar viewing angle can yield an unusual photograph if the details are framed selectively and the composition is strong

Improve your technique

Making movies



If you are new to movie making with a Super 8 camera, a few basic techniques and a little careful planning should help make your first films exciting viewing rather than disjointed clips

Home movies have a bad name—even worse than that of the notorious slide show. Yet there is no reason why an amateur movie should not be interesting and entertaining viewing—even for complete strangers.

The hallmarks of a bad movie are poor camera handling and repetitive or boring sequences. Both these faults can be corrected with a little effort, and the film-making process itself can provide additional interest. The danger with home movies is that after a few badly shot, disjointed efforts the movie maker becomes discouraged.

Operating an 8 mm movie camera is deceptively simple, often much easier than using a 35 mm SLR. Yet the business of actually making a film is quite different. The movie maker needs the eye for a picture of the still photographer combined with a feeling for the continuity of the film. The results can be even more satisfying than those obtained from a still camera.

The feature films that are made for the cinema consistently do this, and though they often have eight or nine figure

budgets, many of the techniques that are used in Hollywood can usefully be adopted for film making at home, at little or no cost. The big difference is scale. Nobody expects you to make an epic with a cast of thousands if all you have is a Super 8 camera, but even a holiday film can be improved if you know how to avoid the most common pitfalls and errors.

The language of films

The most common mistake is to assume that, because you can take good still photographs, you will automatically be able to make great movies. Learning to make a film is rather like learning a foreign language, though, and there are many differences between movie and still photography.

An obvious difference is that of time. Many newcomers to movies use the movie camera in the same way that they use a still camera, collecting individual images or short sequences by the dozen. This completely neglects the time element of film—whereas a still camera freezes a single brief moment in time, a

movie camera makes a continuous recording of what is in front of it. If you overlook its capacity to do this, and use it to make an album of static, unconnected images, you waste much of the potential of movies.

But not only can movie film record the passage of time, it can also introduce time distortion, by compressing time, or expanding it. This does not mean using trick photography. By showing only the beginning and end, for example, a boring piece of action which takes two minutes to complete in real life need occupy only several seconds of film. Conversely, exciting events that last only seconds can be drawn out on film to extract every last bit of impact.

Film has other unique characteristics which can be effectively used, even by an amateur—for example, the action that appears on the screen can be shown in a different order from that in which it was shot. By editing the film—rearranging the order of the sequence—the apparent order of events can be radically changed.

The most valuable use of this facility is in allowing you to apparently be in more



1 The opening shot of the film shows the mother dozing off to sleep, and the child looking bored



2 A second shot, from a distance, sets the scene by showing the two characters in seaside surroundings



3 A close up on the boy shows him losing interest in the beach, and looking round for other things to do



4 This is followed by a brief shot of the pier—a point of view shot—which shows what he sees

A seaside story The most important characteristic of a film is that it tells a story, and when you plan a film, you should make this narrative structure as clear as possible. The series of pictures on this and the next two pages show how a simple story line can be built from an afternoon's filming on the beach. This short sequence was conceived as a silent film—no words are necessary to tell the story—and could be shot with even the simplest of Super 8 cameras

than one place at a time. With your single camera, for example, you can film from a train as it arrives at a station, then change directly to a shot of the train arriving as seen from the platform. This sequence can be shot later on, when you have disembarked.

In the same way, by filming different views of the same subject you can give the audience far more information than they would get from a single shot. Think of feature films in which you have seen this technique used—a couple sitting in the park can be shown in close up, then in a long shot to reveal the activity surrounding them of which they are

unaware. You need not film the sequences in the same order that they will appear. But you should have a firm idea in your mind, before you film such sequences, to avoid wasting film.

Planning a film

Professional films are planned in every detail, and carefully scripted so little is left to chance. Few amateurs are interested in such complex organization, though, if all they want is a record of their holiday or of their growing family. Nevertheless with a small amount of planning you can make an interesting short film out of what might otherwise be a rather dull home movie.

The most important point to remember when making your film is that the person watching it sees it as a narrative—a story—whether or not this was what you intended. Family and holiday films are usually shown in the order in which they were shot, so they automatically form some sort of chronological sequence. What makes many of them difficult to watch, though, is that they are very disjointed. They jump from scene to scene without any connection. This can easily be avoided by writing down a

plan of what you want to appear in the film, even if this just consists of scribbled notes such as 'Arrive airport . . . check in . . . plane takes off . . . lands . . . on bus to hotel' and so on. If you prepare yourself in this way, you will avoid jumps in the story which are impossible to film later on. Such a plan will remind you to take 'scene setting' shots—even a brief shot of a sign will help the audience to appreciate the way the narrative is unfolding.

Try and make each shot that you film lead naturally into the next one. This does not mean that you need to plan everything so carefully that every second is accounted for, but it does mean avoiding confusing sequences of shots. For example, if someone walks out of a room through a door on the right of the picture, it is natural to expect them to appear in the adjacent room on the left hand side of the frame—always try and keep the direction of movement across the frame constant, or the audience will become confused.

The same applies to filming a journey. A car or train, for example, should move consistently from one side of the frame to the other—say from left to right. If it does



5 The camera pans slowly along the pier, keeping the boy walking into the frame as it follows him



9 On the pier again, the camera pans to follow the mother, who finally leaves the frame at the right

not, and in one shot starts moving from right to left, the impression that is given is that the vehicle has turned around, and is going back in the direction from which it originally came.

Sometimes it is impossible to maintain this continuity of direction, or to make scenes lead naturally on from one another. Here, it is possible to use a technique which film makers call a *cut away*. If, for example, you film someone walking into a cafe, and then show them drinking a cup of coffee, but forget to film them collecting the coffee from the counter, you can film a linking sequence at a later date. This cut away might show money changing hands, and because it is a close-up, it can be filmed anywhere, using anybody's hands, and a piece of board as a counter.

Adding polish

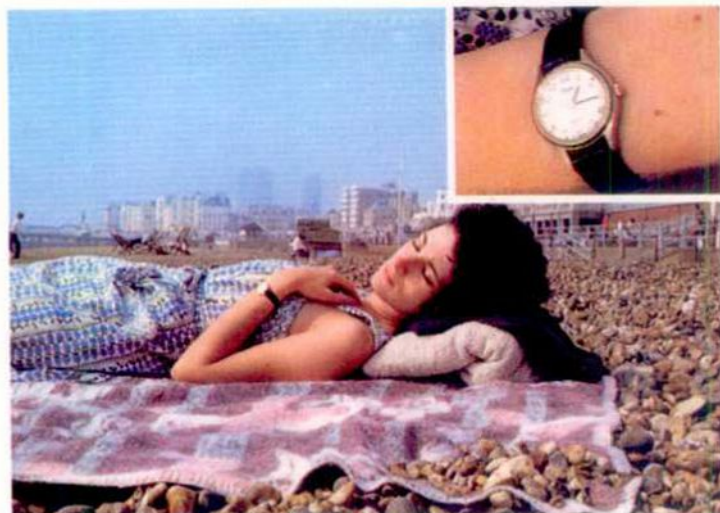
There are other ways, besides careful planning, in which you can improve the look of your films. The way you operate the camera can make the difference between a film that looks slick, and one that looks sloppy. The biggest problem is that of holding the camera steady. Nobody wants to carry a heavy tripod

with them all the time, but this is the only way to ensure that films are free of camera shake. There are a variety of alternatives to the tripod, though, such as the camera supports on pages 986 to 989. None of these is particularly heavy, and all of them enable you to hold the camera steadier than you can by hand.

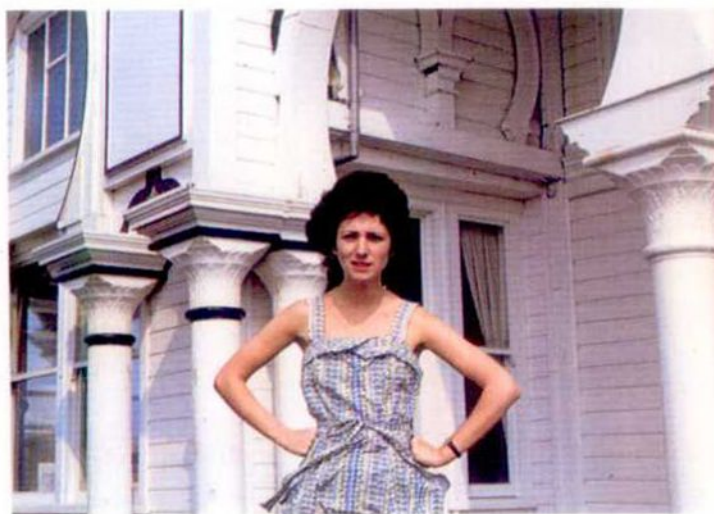
A few movie cameras are now supplied with a rifle stock shoulder brace, so if your camera has one of these, use it whenever possible.

Just as with 35 mm still cameras, camera shake is more pronounced when you are using a long focus lens. If your camera has a zoom lens, use it at the shorter end of the focal length range whenever you can. Do not use a zoom lens as a lazy way of framing up the picture, but instead set the camera to wide angle, and walk towards your subject until it fills the frame. This is sometimes impossible—with scenic views, for example—but this is exceptional, and in most cases, it is the simplest and most convenient way of making sure that the picture on the screen is perfectly steady.

Inaccurate focus ruins almost as many films as camera shake, particularly in



6 Moving back to the beach, the camera zooms in on the wrist watch of the mother to establish the time



10 The mother discovers the boy on the dodgems, and we see a brief view of her angry expression

dim light, when the lens is set to a wide aperture. So you should always carefully set the focusing ring before each shot. Even cameras that have a reflex viewfinder similar to SLR still cameras may be hard to focus because of the way the viewfinder is constructed. Such movie cameras usually have an aerial image viewfinder—that is, a clear glass screen instead of a matt one. Although this produces an exceptionally bright image, it makes reflex focusing all but impossible. Some cameras have a split image rangefinder for this very reason, and it is advisable to use this if it is fitted to your camera. If it has a zoom lens, use the longest focal length for focusing, where errors are most obvious, then reframe the picture at the focal length you wish to use for the shot.

Changing the focal length while you are filming is a very tempting, but is very tiring to watch if it is repeated too often. If you want to move from a broad general view of a scene in to a close up, it is better to stop the camera and move forward, rather than zooming the lens to a longer focal length.

Slow zooming is much easier to watch than fast zooming, but it must be very



7 The boy continues to play on the pier. This shot is held for 12-15 seconds, as there is plenty of activity



8 Meanwhile, the mother wakes up, and then we see a point of view shot that shows us the elapsed time



11 Another point of view shot—this time a close-up of the boy as he whizzes round the pier



12 The final shot brings the film to a clear and definite conclusion—mother and child happily united

slow indeed to work well. If you watch a TV interview, you will notice that this technique is used a lot on the small screen, but that the zooming action sometimes takes as long as a minute to complete. This is much slower than the power zoom on any 8 mm movie camera, and few zoom lenses have a smooth enough action to make hand zooming at this slow speed possible.

Panning the camera across a scene is, like zooming, a great temptation, but unless it is done slowly and for a good reason, it is disappointing on screen. It can work when you want to follow a person or a car moving across the picture, or to set a scene. For example, if you are filming in a market, and you want to put into context the bargaining that is taking place at one stall, you might decide to pan across the other market stalls before bringing the camera to rest. Make sure that the objects in the scene take at least five seconds to cross the screen, though, or you will get *strob*ing when the film is projected—the images will seem to jump across the screen in small steps, instead of moving at a steady pace.

One other way to improve your movies is to make sure that the shots are of a

reasonable length. Ten seconds may seem like an awfully long time to hold down the trigger on the camera, but if there is a lot of activity going on in the frame, this is a perfectly reasonable duration for a shot. It is not necessary to make all shots this long, but you should always err on the long side, as you can easily shorten a shot during editing. There is even a place for brief bursts of one or two seconds' duration, such as of a road sign to indicate location, or of a clock to show the time of day.

Sound and editing

If you own a sound camera, you have one more thing to think about while you are filming. Sound can add interest to a film, but unwanted noise is a distraction. Most sound cameras can be fitted with a pair of headphones to monitor the sound, and a separate microphone, and both these accessories are worth using, particularly if you can coerce somebody else to control the sound while you operate the camera.

Home movie cameras often generate a loud whirr, and a built in microphone cannot usually avoid picking this up. A hand-held mike can be fitted with a long

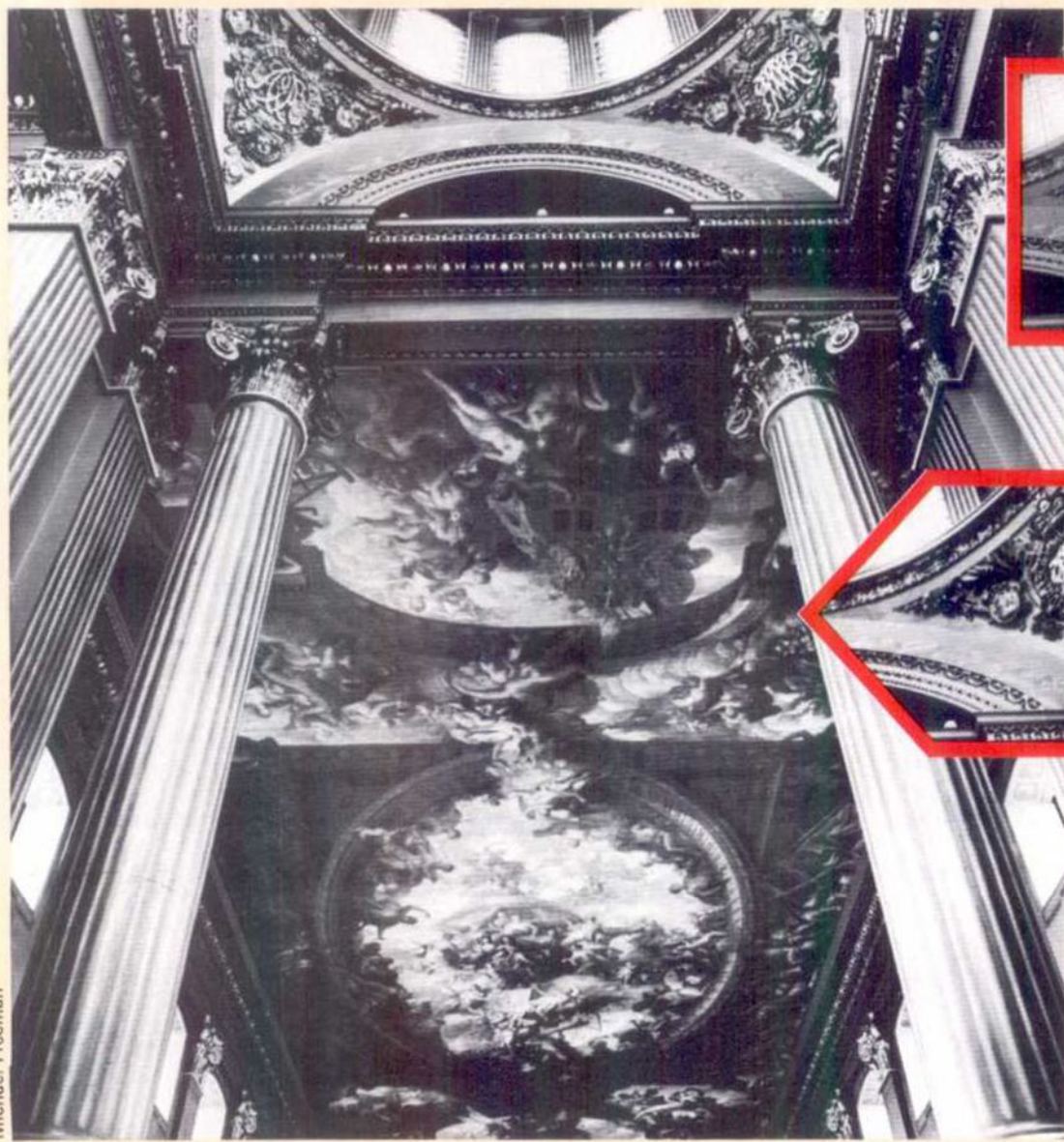
lead, and moved several metres from the camera to eliminate this annoying noise, and to get a better recording of the source of sound. With music, this technique can be particularly effective. Music can also be added later if you own a projector that has dubbing facilities.

Sound cameras usually have an automatic gain control to prevent the magnetic stripe from being overloaded in loud sequences, but this can also bring up background noise in quiet passages. If, for example, you are filming two people talking, try and avoid long breaks in the conversation, or the sound of the camera will gradually increase and become annoying. The gain control, if fitted, should be on its low setting to prevent the first few words of each new burst of conversation from overloading.

Editing is in some respects as important as shooting the film—many feature films have been rescued in the cutting room—but it is largely ignored by the home moviemaker. By judicious cutting and rejoining of your film, you can vastly improve your movies, and remove irrelevant sequences. The subject of editing and dubbing is covered in a subsequent article.

MTF curves

Image sharpness depends upon more than resolution of fine detail, and for a more complete picture of lens quality, its Modulation Transfer Function must be measured



Michael Freeman

Photographers often used to be beguiled by advertisements which lauded the remarkable resolving power of a particular lens. It seemed that the lens which could resolve the most lines per millimetre must inevitably give the sharpest image. But there is more to sharpness than resolution alone and, for a complete picture of the qualities of a lens, designers plot its *Modulation Transfer Function* or MTF.

The most important feature of MTF is that it involves the measurement of contrast—without good contrast in the areas of fine detail, definition appears poor, no matter how

many lines per millimetre are resolved. In fact, *modulation* is simply another word for contrast, although it is only appropriate in the context of MTF. Modulation is basically the difference in intensity between the darkest and lightest parts of the image.

The MTF system works by comparing modulation in the image projected by the lens with that in the original subject. Inevitably, modulation is slightly less in the projected image than in the subject—that is, some of the original subject contrast is lost as it is *transferred* through the lens. The ratio between the modulation in the original subject

Sharpness A contrasty shot can look sharp even when resolution is poor (left).

A low contrast shot, on the other hand, looks unsharp despite the fine detail shown

and the modulation in the projected image is known as the *modulation transfer factor* and forms the basis of MTF calculations.

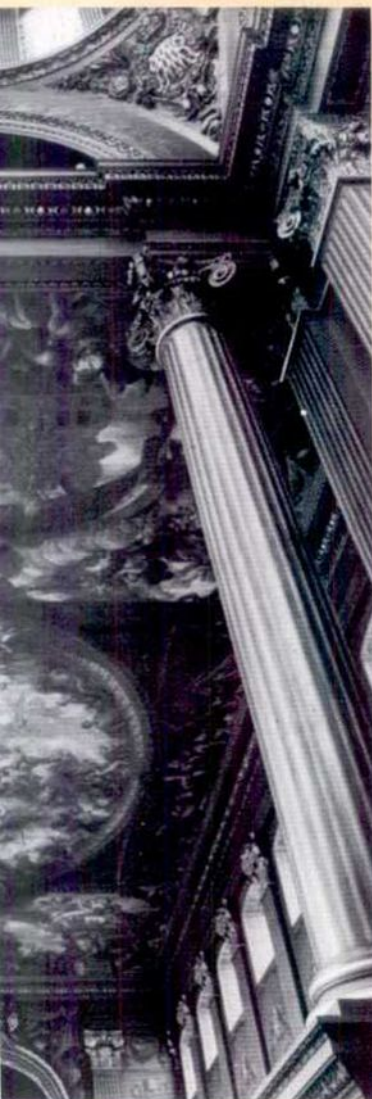
With a perfect lens, none of the original subject contrast would be lost and modulation in the projected image and the original subject would be identical. The modulation transfer factor would therefore be one and this is the maximum possible

value. Unfortunately, no lens can reach the ideal, and all values for the modulation transfer factor are less than one.

For every lens, though, there is not just a single factor but a whole range—factors can be calculated for different subjects, different apertures, for the centre of the image and for the edge, and for many other conditions. For the MTF, it is the variation of the modulation transfer factor with the fineness of detail that is important. Indeed, the MTF is simply a graph on which the modulation transfer factor is plotted against a measure of fineness of subject detail.

Spatial frequencies

As with resolution tests, the fineness of subject detail for MTF tests is shown by the spatial frequency of line-pairs (see page 1074). However, the lines on the test chart are not solid black bars separated by white spaces. Instead, the dark lines are faded very gradually into the



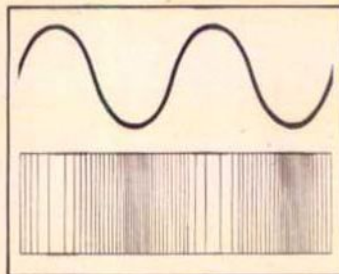
lighter spaces in between. The fading is very even and carefully controlled so that if the intensity of shading is measured at various points across the pattern of lines and plotted on a graph, the graph shows a sequence of symmetrical waves, referred to as *sine waves*.

Consequently, scientific wave terminology is used to describe the characteristics of the pattern. Fineness of detail is therefore described in terms of the *frequency* of dark lines on the chart. A line-pair—a single wave on the graph—is a cycle and so spatial frequencies are given in terms of the number of waves in a given space—that is, in cycles per millimetre. With coarse detail, there are few waves—per millimetre: with fine detail, there are many waves—many cycles—per millimetre.

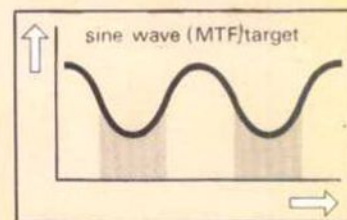
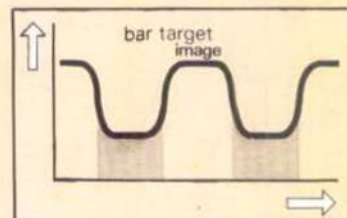
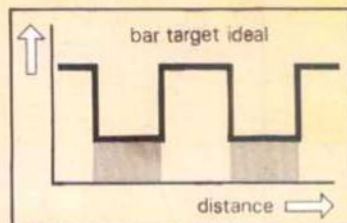
MTF curves

Modulation transfer factors—the loss of contrast in the projected image—can be worked out for various spatial frequencies and plotted on a graph. This graph is the MTF of the lens under test, and it is specific to that lens.

Nevertheless, it is noticeable that as the fineness of detail increases, so does the loss of contrast—as frequency increases, so the modulation falls. Eventually a point is reached where the contrast is so low that detail is lost. This, therefore, is the limit of resolving power of the lens. This limit is often



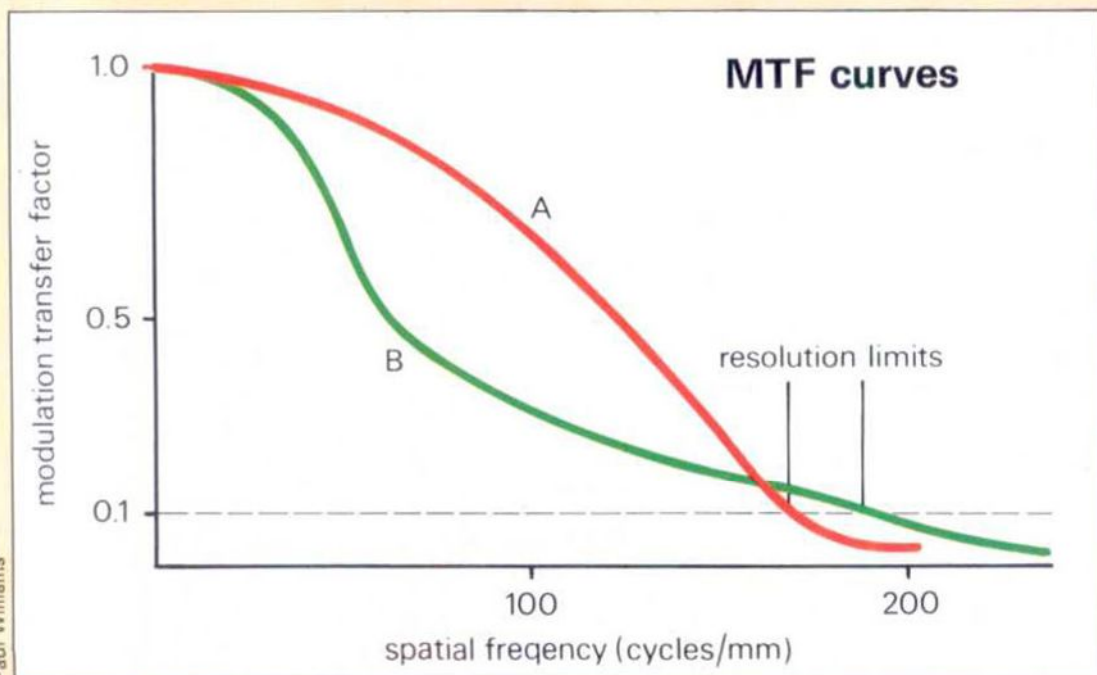
Sinusoidal target MTF tests use a target with a gradual change from black to white. The target is oscillated to blur the black lines into a continuous tone



Paul Williams

Graphs showing the change in tone across various test targets. The middle graph shows how the lens softens the edges of the bars in the projected image

Typical MTF curves Lens A gives high contrast with coarse detail but cannot resolve fine detail. Lens B gives generally lower contrast except at high spatial frequencies, where it is better than lens A

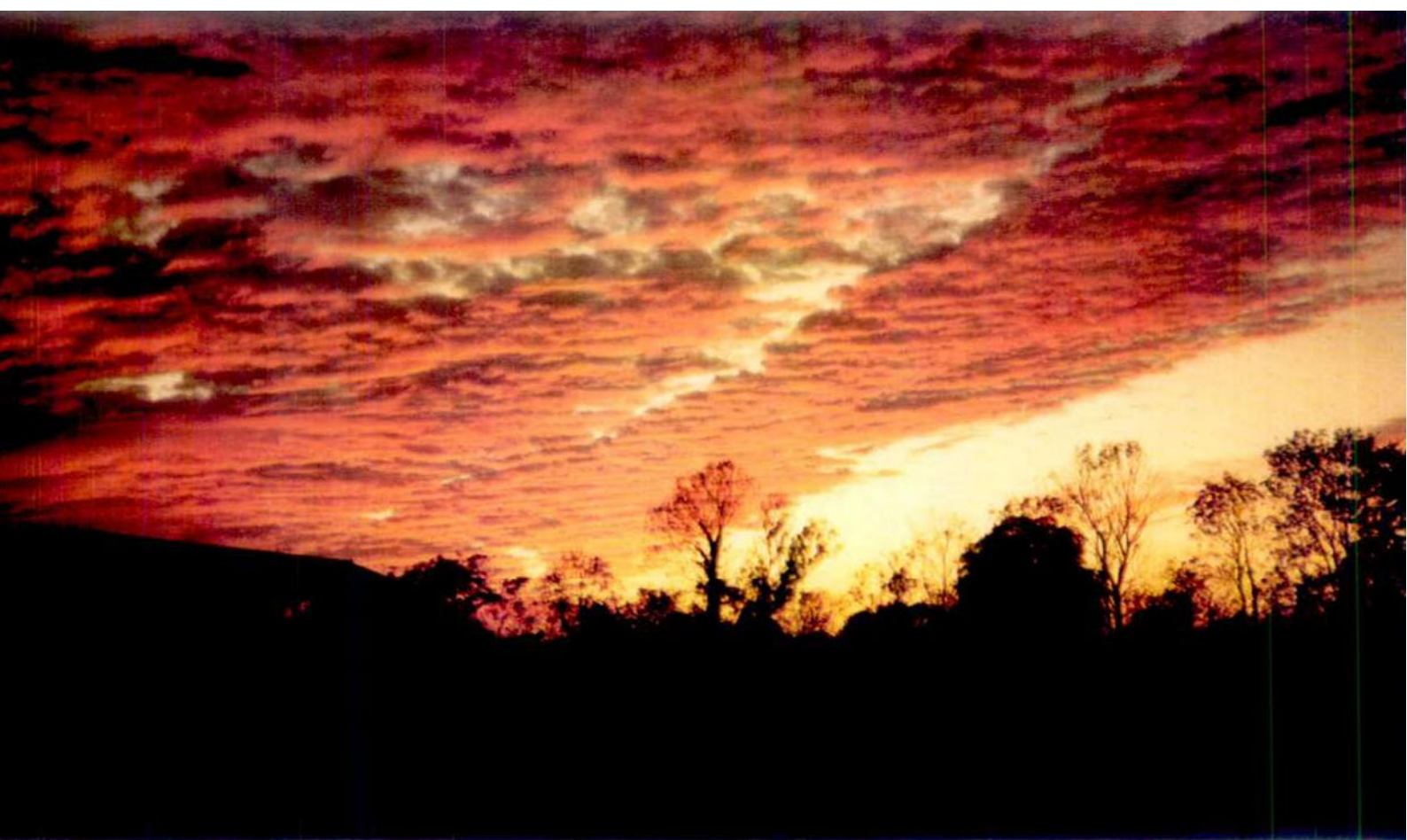


Modulation is measured identically in both subject and image so that the modulation factor for each frequency can be found. With modern test apparatus the MTF curve is plotted automatically by a machine linked to the image analyzer.

Unfortunately, a single curve is inadequate, so a set is needed to give a fuller picture of behaviour. Curves are produced for on and off axis positions, with various wavelengths of light, and at different target orientations for each aperture setting of the lens.

A very useful property of MTF curves is that they can be combined or *cascaded* together, to produce a single curve. This is done by simply multiplying together the transfer factor values of each part of the system at each frequency to give the resultant MTF of the system.

MTF curves can be produced for other parts of the photographic system, such as the film and the enlarger. The resulting curves can then be cascaded to give an MTF for the whole system, showing the performance from subject to final image.



Creative approach

Sunrise and sunset

Sunrises and sunsets can make many otherwise mundane scenes look spectacular, but you need imagination to create an eye-catching image and restraint to avoid the cliché

Few photographers can resist the attraction of sunsets and sunrises. With their brilliant glowing colours and dramatic lighting, they are instantly photogenic, and, with the right exposure, invariably give an attractive picture. Yet many sunset pictures are pleasant rather than outstanding and to take a really stunning sunset, you must do more than merely point the camera at the sinking sun and press the shutter.

While beautiful sunsets are common enough in many parts of the world, really spectacular skies are comparatively rare—it needs a particular combination of atmospheric conditions to give the classic image of a fiery disc sinking slowly in a copper sky amidst clouds ablaze with purple and gold.

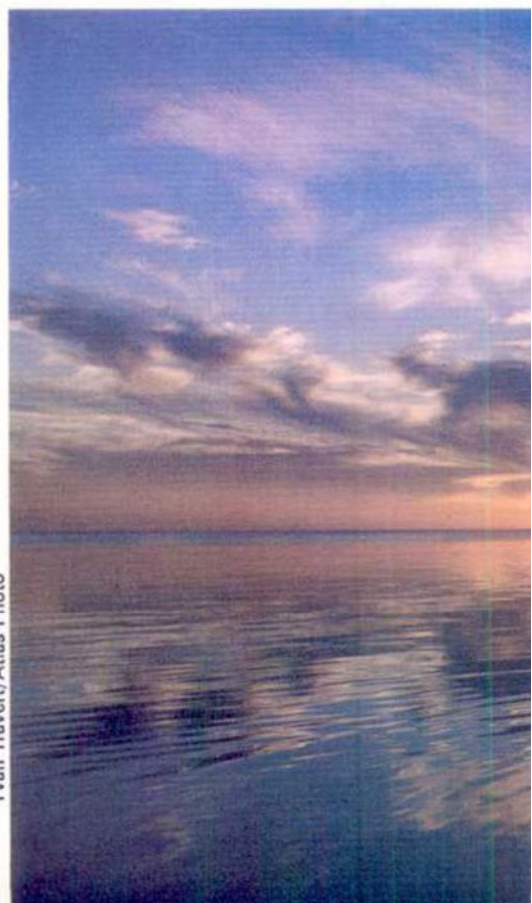
At rising and setting, the sun is naturally a warmer colour than at other times of day because, at a low angle, its rays have to travel further through the atmosphere. But for a really red sunset, there needs to be some impurities in the atmosphere to help scatter the blue light—sunsets are rarely very red in clear weather. The best sunsets tend to occur not after a hot, still day, but when the weather suddenly clears after a change-

able day. If this type of weather is forecast, it is worth looking for a suitable vantage point.

When the atmosphere is polluted, though, the sunset may be very red even in clear weather—tropical sunsets are often very red because of the dust in the atmosphere.

Some of the most spectacular sunsets in the northern hemisphere were seen after the eruption of Mount Saint Helens in 1979 filled the atmosphere with volcanic dust which spread westwards from the volcano. On a more mundane level, urban pollution, while generally undesirable, does help to produce some attractive sunsets and sunrises. If you live near a heavy industrial area, it is worth getting up early to catch the sun rising red behind the gaunt silhouettes of the factories.

Nevertheless, for the greatest spectacle clouds are important, preferably close to the horizon, in different formations and at different heights. Clouds reflect and absorb the light, and the most interesting sunsets occur when there is a wide variety of clouds at the same time. In unsettled weather, thick woolly cumulus often looks effective, particularly



Yvan Travers/Atlas Photo

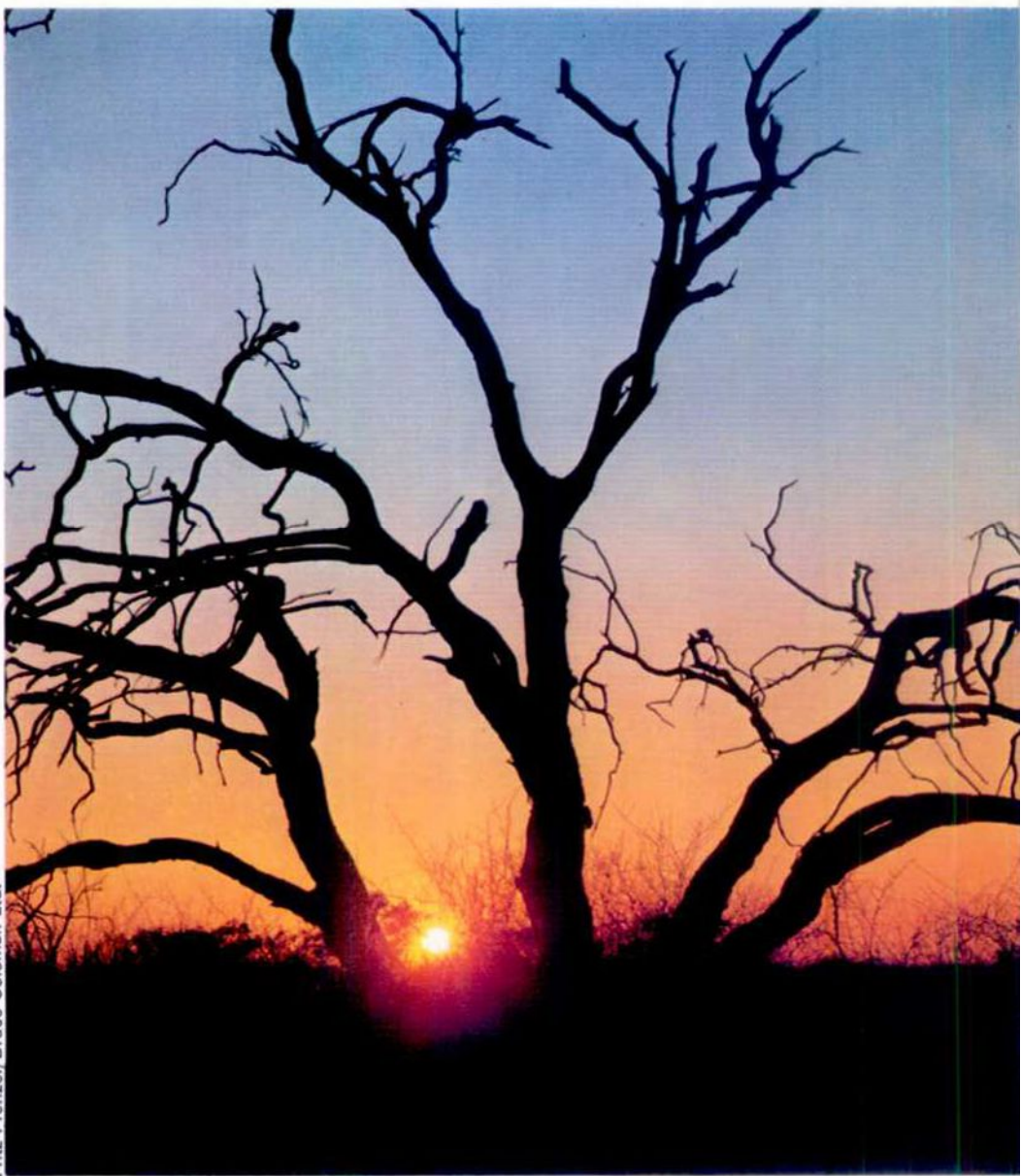
Red sky Colourful sunsets like this, with the sun below the cloud base, occur rarely and last for only a few minutes, so work quickly

when combined with higher, thin layers. Tropical sunsets appear so marvellous because the towering thunderheads of cloud that have built up during the afternoon heat are usually broken up after a short, heavy storm and by sunset these allow an intricate play of light to filter through. However, there is always the chance that the sun may sink behind a cloud bank before it reaches the horizon and not reappear before it sets. A sun heavily dimmed by cloud can actually appear more colourful on film than in reality, as the grey clouds often reproduce as blue or purple on film. Take the time to select a few of the best features of any particular sunset and concentrate on these. Choose the camera technique that will focus attention on these features.

For instance, under certain conditions, the disc of the sun itself may be an interesting subject. In hazy weather, as with the tropical sunset, the disc appears to be enlarged and slightly patterned, and if the haze becomes thicker towards the horizon, the red sun may seem to set in mid air. In this case, use a telephoto lens to emphasize the effect.

You can also focus on the surrounding sky, taking either a general view that includes the sun, or a detail of the cloud formation, underlit, backlit or streaked with colour. You can create dramatic or unusual effects by emphasizing different areas of balance within the frame, for instance, darker colours on top, making the picture seem top heavy. If you isolate a small area of sky, you can obtain many interesting variations by using the lines and colours to create an abstract pattern.

Fritz Prenzel/Bruce Coleman Ltd.



Sunrise in south Australia Try using the colourful light of the low sun as a backlight to create strong foreground silhouettes

Lake Diebo, Mali A wide angle lens allows you to take in a wider scene for added interest and produces more than just a 'sunrise'



Alternatively, you may want to treat sunrise or sunset as part of a landscape. In this case, the horizon, and therefore the viewpoint, becomes a major consideration. Contrast is always high at these times of day, and the successful balance of contrast levels with subject matter is a delicate task. Details in the foreground are necessarily backlit, and become silhouetted against the sky. The brighter and less cloudy a sunset or sunrise, the more pronounced the silhouette will be.

Silhouettes are a very useful graphic technique when you are concentrating on the actual disc of the sun, which will benefit considerably from a positive shape juxtaposed in the foreground, but without a colour to compete with the sunset itself.

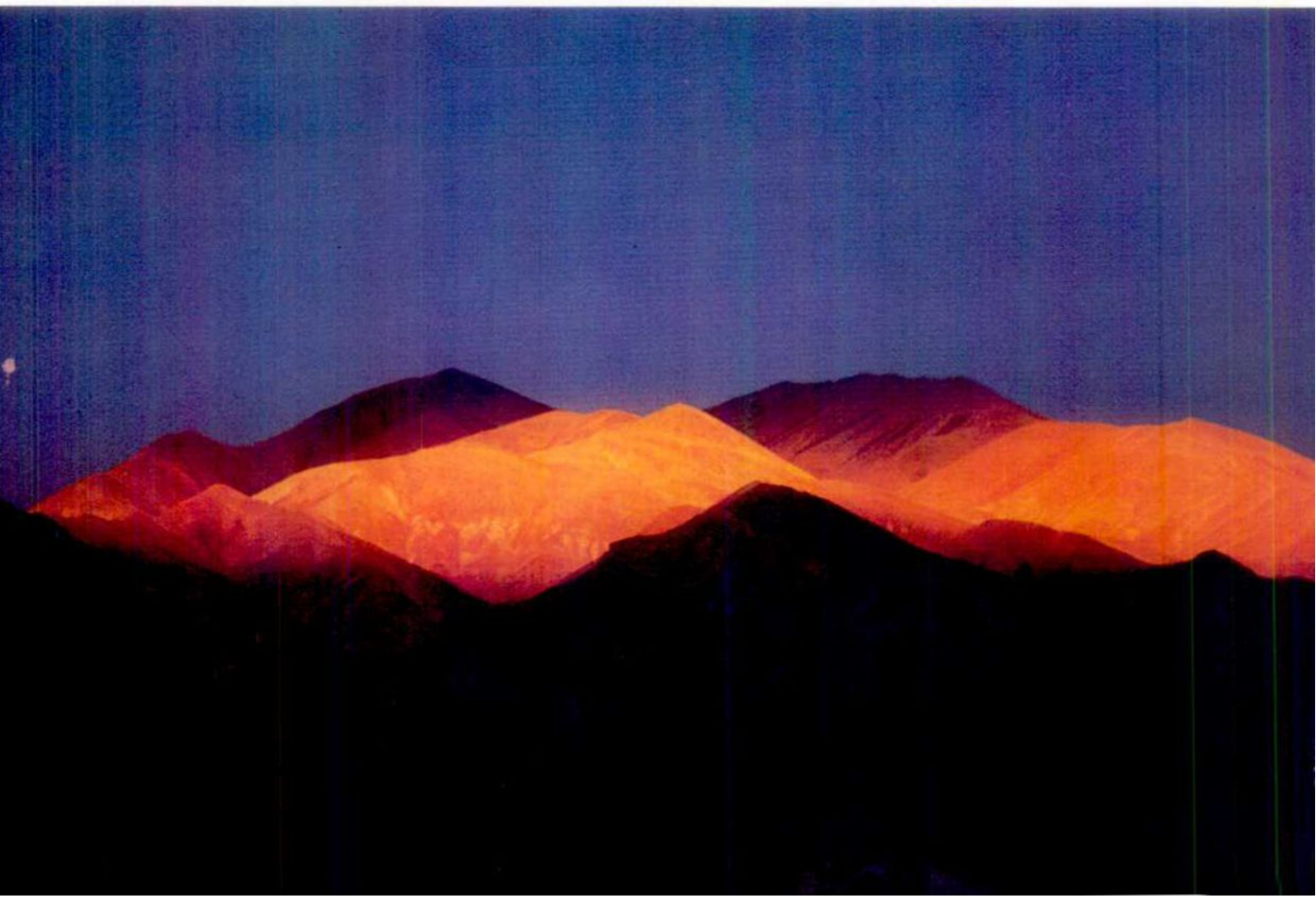
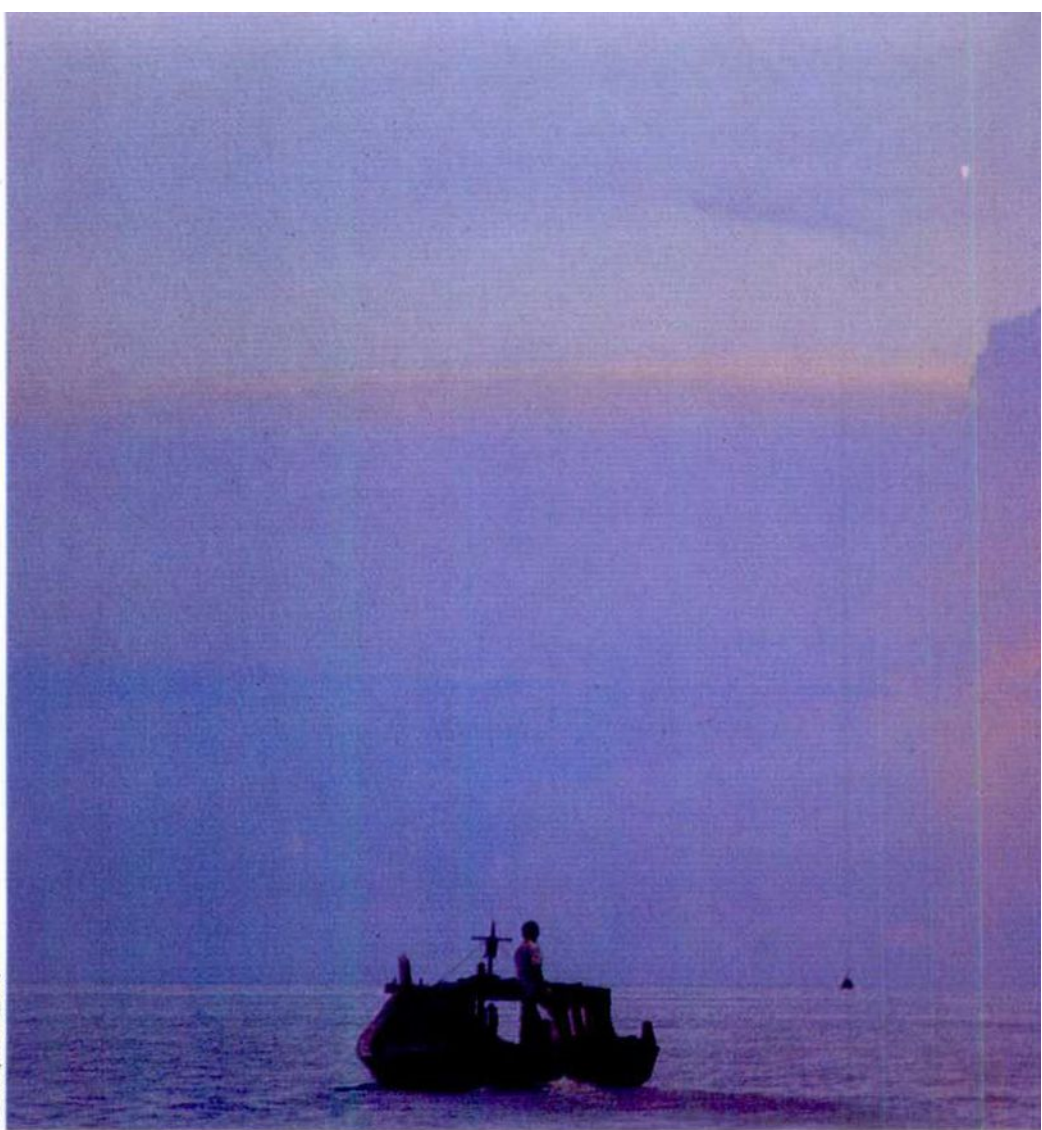
Creative approach

At sunset or sunrise, it is usually worth choosing foreground details with interesting outlines. Set the exposure according to the effect you want. An average exposure may show some foreground detail, but will usually give weaker colours to the sky itself. An exposure based on the lighter areas of the sky will give deep, saturated colours and an intense silhouette. It is a mistake, however, to expose for the foreground as the brilliant sky colours will almost certainly be washed out. A graduated neutral filter can help to show both the sunset and the foreground however.

Foregrounds often pose a problem with sunset shots, particularly if the sky is not very interesting. Unless there is a fascinating silhouette, it is important to include some detail in the foreground to enliven the picture. The area immediately in front of the camera should therefore be fairly light in colour, otherwise it may be impossible to achieve the correct exposure—ideally it should be light enough to balance the sky. A large expanse of water—the sea, for instance—that catches the reflection of the sky, and adds subtle changes, is ideal. Mud flats or beaches serve a similar purpose, particularly when rounded off with a small silhouetted figure or boat.

Twilight offers very different possibilities. Just occasionally, when the weather conditions are right, there may be a vivid afterglow, when the sun, no longer visible, lights up very high clouds in a spectacular way for a moment

Vautier/de Nanxte





Colin Molyneux



Malaysian fishermen Brilliant colours are not essential for a dawn scene

Death valley In the opposite direction to a sunset, you may find a patch of warm colour as the last rays of light stretch across the landscape.

Pastoral scene Instead of concentrating on the sky, the photographer has exposed this shot to feature the pastoral scene in the foreground. **Waves** Rather than including the sky itself, this shot combines its reflection with the water

John de Visser



or so. For its rarity, this effect is nearly always worth photographing.

Twilight is also useful photographically because it tends to create an even-toned area of sky that graduates smoothly into darkness above. This can produce an uncluttered background for silhouettes, and give a large, clear reflection in water, which can help rivers and lakes to stand out clearly in a distant landscape view.

Twilight produces soft pastel colours, and the long exposures which are necessary at this light level tend to make colours intermingle and produce dramatic swirling effects. A particular feature of shooting pictures in the early morning and evening is the peculiar, almost uneasy sense of quietness that exists at these times. Try to capture this feeling in your photographs. The illumination is invariably very blue in colour, even when there is a rosy glow in the direction of the sun. Bear this in mind, as the

results may otherwise surprise you.

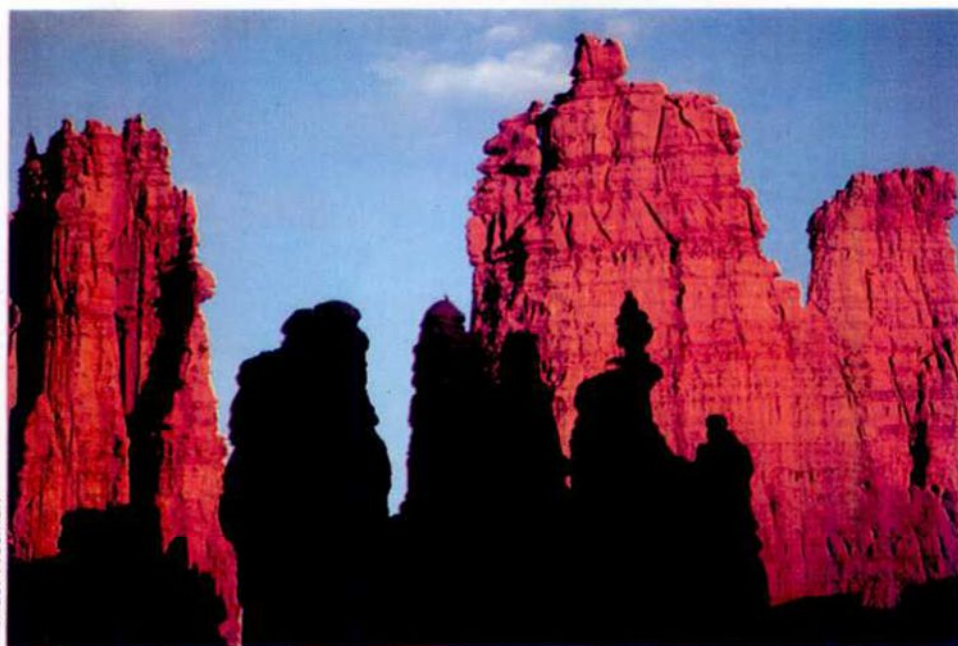
In photographs, sunsets and sunrises are difficult to tell apart. They are quite different events to see but a still shot cannot normally distinguish between them—except, perhaps, in cities where pollution in the atmosphere at different times of day causes a particular effect with which you are familiar.

Nevertheless, local weather conditions may make a difference at any one place. For example, in many mountainous areas, dawn finds the valleys filled with cloud, from which the peaks stand clear. By late afternoon these peaks may be shrouded. If you are planning to take sunset or sunrise photographs in an unfamiliar place, it may be a good idea to check these conditions.

Because there are fewer people around, it may be easier taking pictures at sunrise, particularly if you are taking a landscape picture of a well known beauty spot, but in general, sunrises are

more difficult to plan for. You may have to decide the location on the previous day, since you will then have to set up the camera in semi-darkness. Predicting the exact point where the sun breaks the horizon is easy only in the tropics, where the sun rises almost vertically in much the same place every day. Everywhere else the sun rises at an angle, so that the first glow you see is not where the sun will eventually rise. So if you are planning a shot so that the sun clears the horizon at a precise point, you may have to do a dry run the day before.

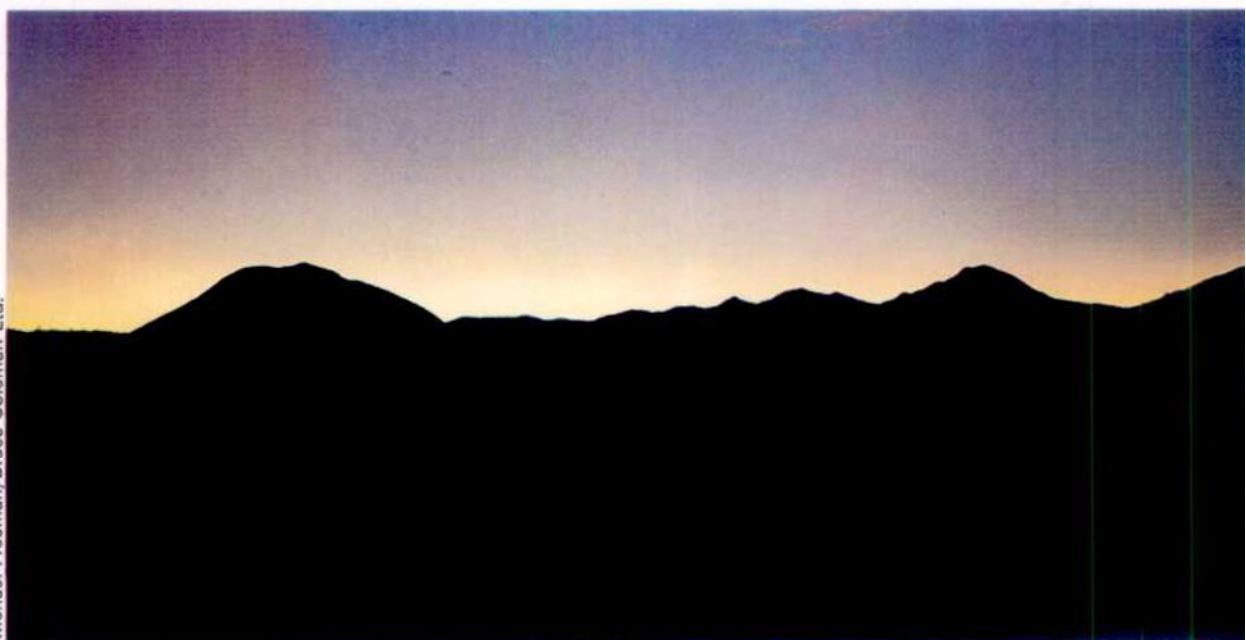
Both at sunrise and sunset, however, the light changes very quickly, and your reactions must be sharp to take advantage of this rapid change. One way to record these effects is to shoot a sequence of photographs several minutes apart as the sun is setting or rising. This will enable you to inspect every small detail and decide the best time to shoot for the best picture.



Arizona rocks Warm light reflected in the rocks creates an attractive sunset shot—without the sun itself. The dark foreground shapes add extra effect

Dawn at 2000 metres The graduated intensity of the blue sky and the dark, solid foreground create an attractive sunrise without dramatic colours

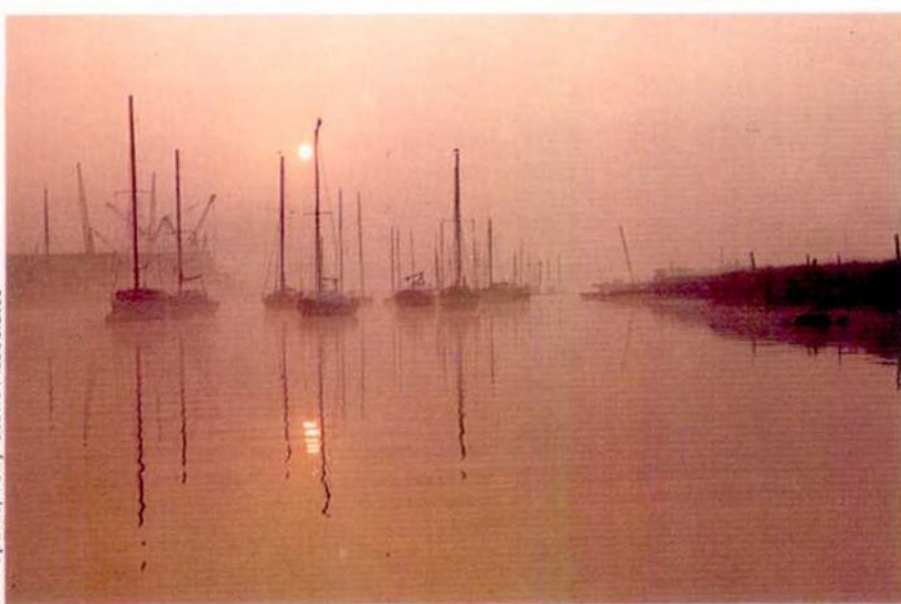
Michael Freeman/Bruce Coleman Ltd.



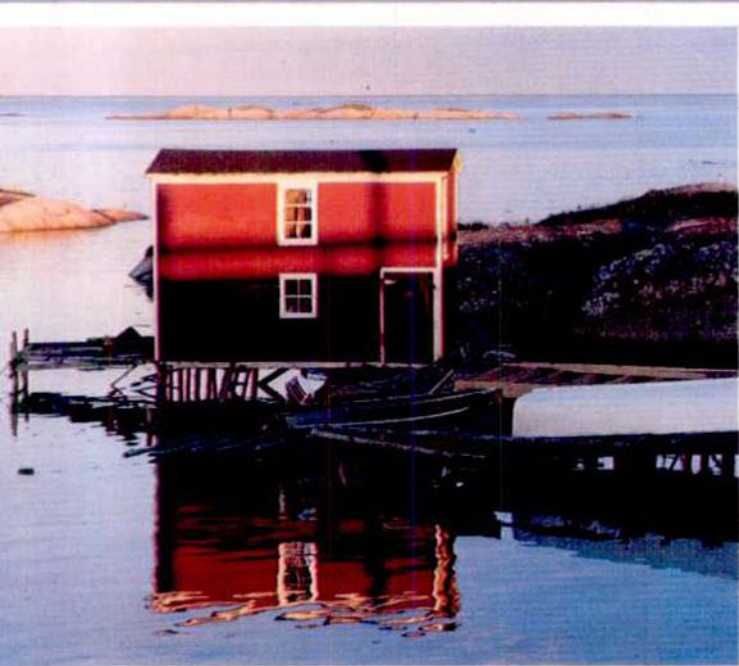
Sunlit building Direct light can make your shots attractive, but it is equally effective to use the light as it is reflected from other subjects



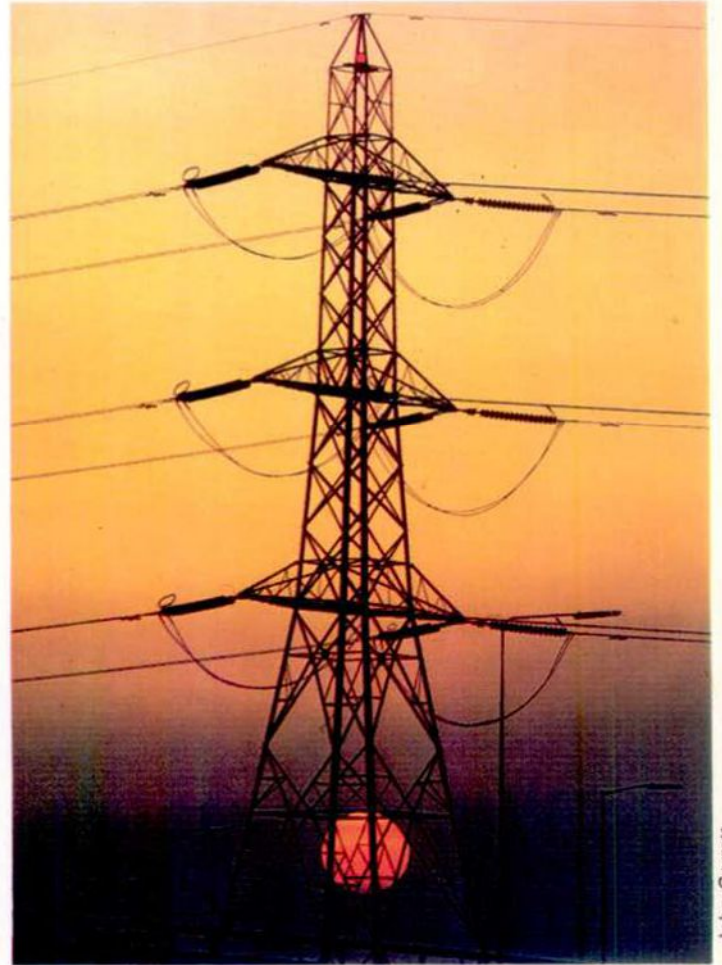
Jim Sparks/Tony Stone Associates



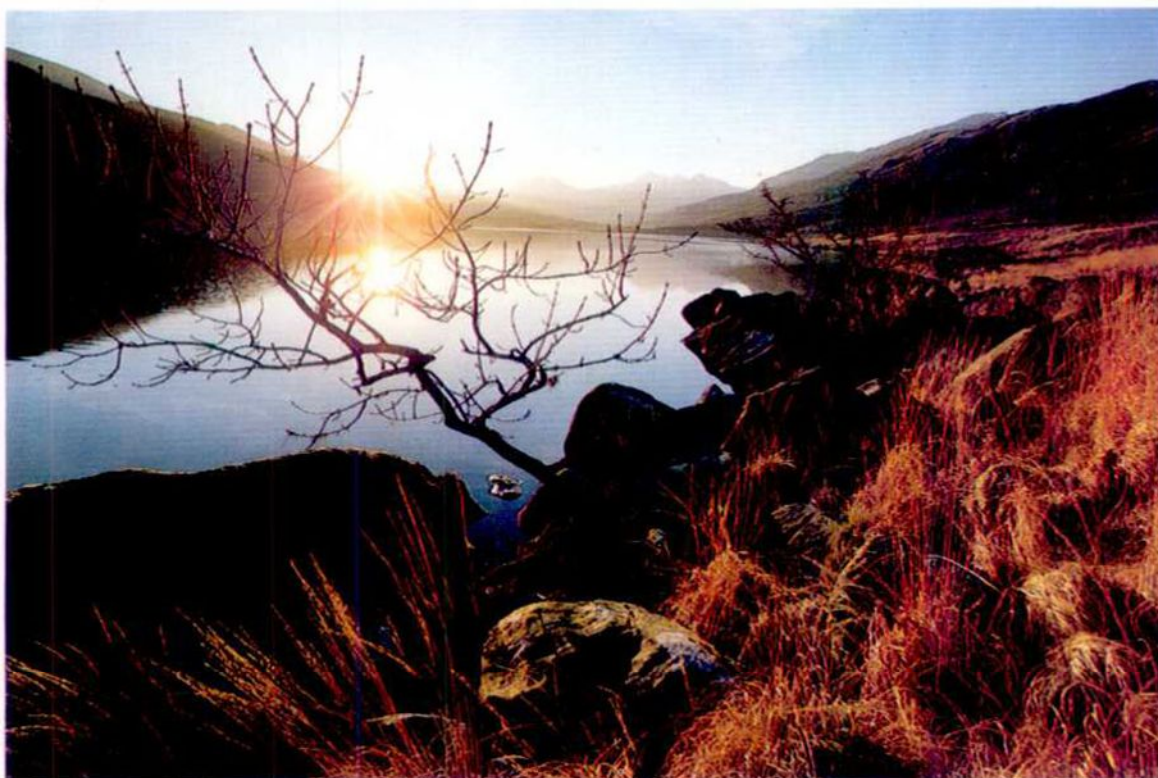
Yachts in mist This shot does not exploit the light usually associated with a sunrise, but gains atmosphere from the diffused, golden light caused by the mist



John de Visser



John Garrett



Colin Molyneux

Sun and pylon For silhouette shots it is worth thinking of more unusual subjects to place in the foreground. A 300 mm lens is ideal for this purpose

Landscape For some shots, a low sun can be used to give extra qualities to a scene which already has enough interest to make an attractive photograph

110 cameras

Genuine pocket cameras, 110s are popular as snapshot cameras or as 'notebooks' for the buff

Although the 35 mm format is still favoured by most 'serious' amateur photographers, the 110 is becoming ever more popular for snapshots. Light, compact, easy to use, and generally inexpensive, the 110 is a genuine pocket camera and its popularity is easy to understand. For those who simply want shots to remember their holiday by, or snapshots of the family, it is ideal. But it can also make a useful pocket notebook for the serious photographer.

All film for 110 cameras comes in simple, easy to load plastic cartridges. They can be quickly slotted into the camera with the minimum of fuss and can be lifted out when the film is finished without even being rewound. And, if you are prepared to waste a frame, you can swap one film for another—say a slow film for a fast one—in mid roll. Naturally, such a system is very popular with snapshot shooters who cannot be bothered with the more involved 35 mm loading procedure—and it is completely foolproof. The only disadvantage with the cartridge system is that the film cannot be pressed firmly up against the aperture with a pressure plate. This means that it

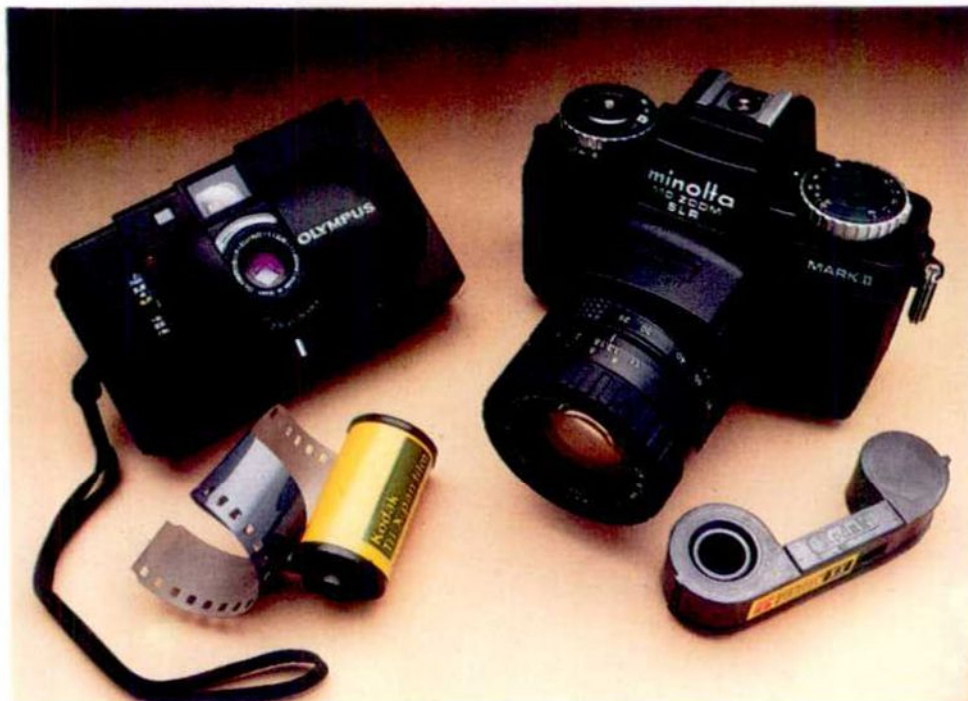
cannot be used with fast lenses that have a small depth of focus.

The cameras are referred to as 110s not because of the film size, as many people assume, but simply because Kodak used that number to identify the system when it was first introduced. Nevertheless, it is the small film size that allows the camera to be so compact—each frame of 110 film measures only 13 x 17 mm.

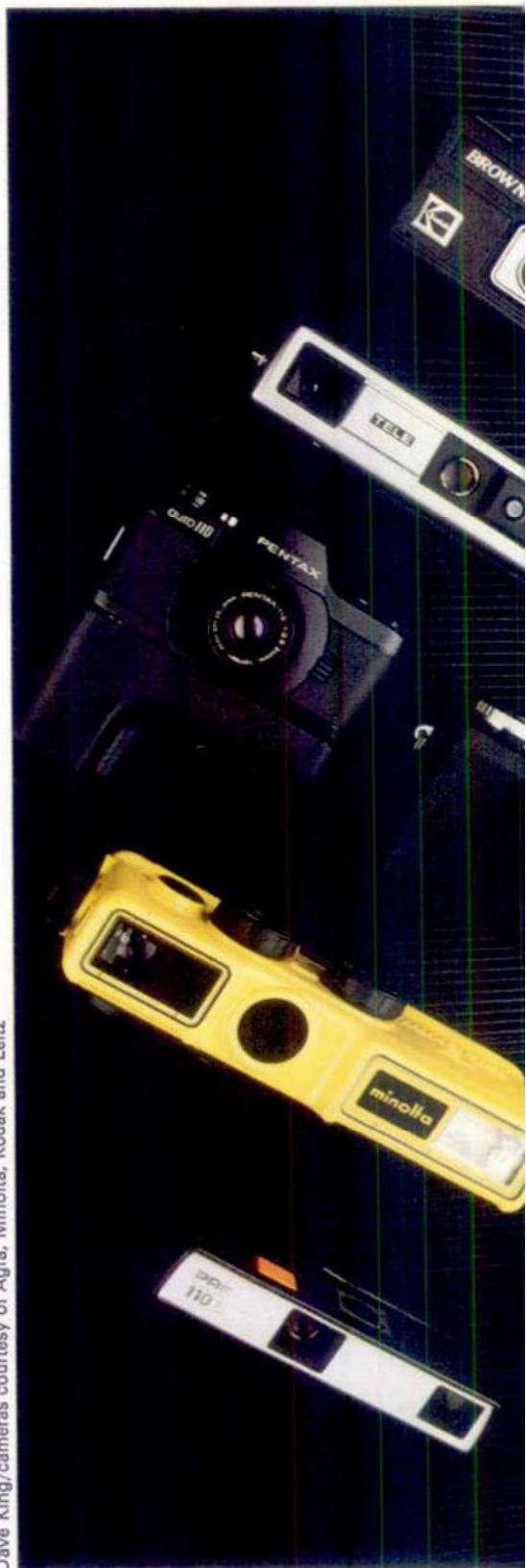
Of course, although for ease of handling a small film is an advantage, it is the film size that puts off many serious photographers simply because a small

Steady grip The integral case of the Kodak Ektra 110 folds out to form a camera grip—a useful feature in a format prone to camera shake.

Compact 110? Not all 110s are tiny—the sophisticated Minolta (below right), with its zoom lens, is larger than the 35 mm compact Olympus XA



Dave King/cameras courtesy of Agfa, Minolta, Kodak and Leitz



negative will not stand much enlargement without severe loss of quality. Any frame enlarged above enprint size tends to be very grainy and lacking in clarity. Enlargements are also proportionally more affected by dust, fingerprints, and handling scratches. Negatives, also, are prone to being bleached out due to the intense light used in printing, so copy prints can sometimes be unsatisfactory.

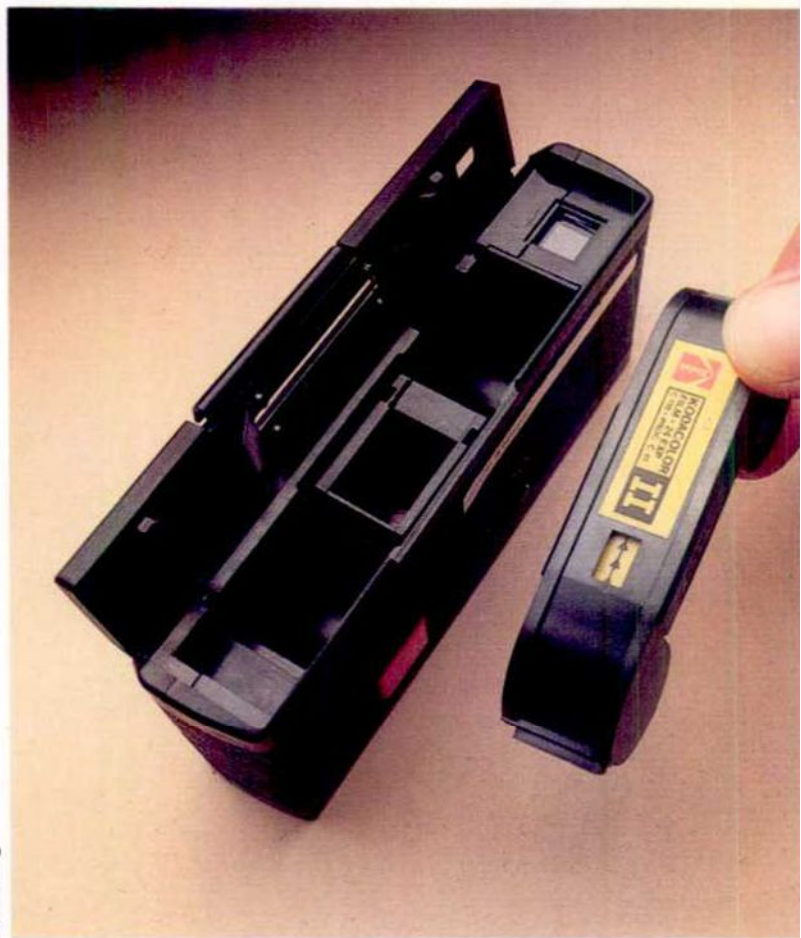
Most 110 cameras have plastic lenses, or precision-moulded acrylic lenses, to be more precise. These are often regarded as inferior to glass lenses, and



110 selection
With the 110 format now rivalling 35 mm in popularity, the range is extensive, from the simple Brownie (top left) to the refined Pentax. Loading a 110 involves simply slotting a cartridge into the camera back

Most 110 camera lenses are around 24 mm, which is the equivalent of the standard 50 mm lens on a 35 mm format camera. Some cameras also have a telephoto lens which slides over to replace the standard lens as required. Several of these telephoto lenses must be focused, even though the prime lens is often fixed focus.

Some of the 110 systems are miniature SLRs complete with a full set of interchangeable lenses—wide angle, standard, telephoto and a tiny zoom lens with a range equivalent to 50 to 135 mm on a 35 mm camera. These SLR type cameras have reflex viewing and



Dave King

indeed the earlier types were. But modern injection moulding machines can produce very good acrylic lenses, designed with the aid of sophisticated computer programs to reduce lens error to an acceptably small amount, within manufacturing limitations. It is now possible to decide whether or not a lens can effectively be manufactured before any stage of production begins. An enormous amount of complicated work in the design and manufacturing stages goes into producing these deceptively simple cameras.

110 versus 35 mm
With negatives barely half the size, 110 film inevitably gives inferior results, but on good quality film—here Kodachrome 64—results can be quite acceptable even when enlarged (left)



Steve Mansfield



focusing and automatic exposures and generally come in a full kit complete with many accessories.

It is reasonable to assume that a more expensive lens will produce a better quality negative. However, one of the major factors affecting image quality with 110 cameras is camera shake—they are so light that it is easy to move the camera when pressing the shutter. One instruction booklet for a simple model actually advises the photographer to 's-q-u-e-e-z-e' the shutter—stressing the general need to hold most 110 cameras as steady as possible in order to reduce movement blur.

Some 110 cameras can also be awk-

Extra features Basic 110s can only be used in good conditions, but the more expensive cameras have extra facilities that increase their versatility.

Built-in flash, for instance, makes some kind of shot possible even in the darkest conditions. Even more useful are alternative shutter speeds—typically 1/50 and 1/100 second—that allow you to alter the exposure to suit the weather; the speed control is often marked in cloud or sun symbols rather than fractions of a second. Other features available include a telephoto lens that can be slid across to replace the standard lens, and variable focusing—with symbols to show focusing zones

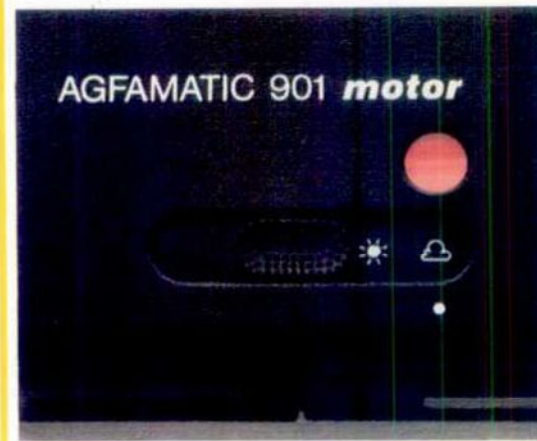
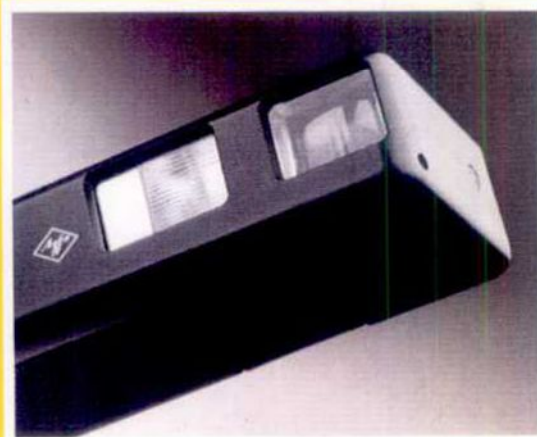
ward to hold. It is easy for the fingers to stray in front of the lens, and on some models, even simpler for the hand to partially obscure the flash unit, especially where it is incorporated into the camera.

Camera prices vary with the complexity of the model. The simplest have only the most basic features, whereas the models at the top end of the market are extremely sophisticated. It is worth remembering, however, that complex models can cost more than an ordinary 35 mm SLR and that the limitation of the 110 format could mean that the full potential of these more advanced cameras is underutilized. If a high quality end result is important, it is perhaps better to buy a 35 mm compact.

The cheapest cameras generally have both fixed shutter speed and a single aperture which means exposure cannot be adjusted. Pictures can therefore only be taken in good light or by flash. Apertures are normally between $f/8$ and $f/11$, giving a good compromise between depth of field and speed while the shutter speed can be anywhere from 1/40 to 1/100 second. With some cameras it is not even possible to adjust exposure

Underwater shots to a depth of about 5 metres are possible with the Minolta Weathermatic. The yellow plastic cover also keeps out dirt, dust, rain and snow and the camera controls can be operated even in gloves.

Slide mounts 110 slides can be mounted either in small 3 x 3 cm mounts or in 5 x 5 cm mounts—35 mm size—that can be shown on a normal 35 mm projector



requirements by changing film since they can only be used with film of 100 ASA, for example. The focus also is fixed and the nearest a subject can be approached is about one metre.

The middle range cameras are more complex but more versatile, allowing variable exposures with a number of different shutter speeds such as 1/50 for dull light and 1/100 for brighter conditions. The shutter speed control is often marked by a weather symbol—the cloudy setting giving the



slower shutter speed, the sunny setting giving the faster setting. More advanced cameras have automatic exposure facilities which are electronically controlled with a full range scale of shutter speed and aperture combinations.

Variable focusing is also available on the more advanced models. Some cameras again have a range of appropriate symbols marked on the lens representing typical subject distances. Others have a scale on which distances are marked and some cameras have a rangefinder system. The more expensive models also tend to have built in flash—some flash systems switch themselves on automatically in low light, using an electronic light level sensing system.

Many models have a number of signals visible in the viewfinder. These include focusing symbols and low light warning as well as a range of flash information. Parallax correction marks are also included on some cameras to help in framing close subjects.

Another specialized camera has a yellow plastic body. It floats and can be used underwater. The body seals out dust and sand as well as water and the controls are big enough to be used easily with a gloved hand—when out skiing for example.

Other features available are motorized film advance, tripod sockets, special battery check facility, delayed action

Sophistication The most expensive 110 outfits are complete camera systems. This one includes an autowinder, interchangeable lenses and filters, and a flashgun

timer and even a date imprinting device on one model. Most come with a wrist strap for easy carrying. A separate case is available for several models, though their small size and streamlined shape does mean these cameras can easily be carried in another bag or pocket.

Film for 110 cameras is available in ratings from 64 to 400 ASA. A notch system on the film cartridges allows cameras to adjust to the different ratings. Film is available in black and white and colour for both prints and transparencies. However, 110s have been developed mainly with the colour print market in mind. One reason for this is that the film involved has an immense tolerance and prints can be produced even when the negatives have been quite wrongly exposed. This is a further benefit for the inexperienced or non-technical photographer.

Colour reversal film on the other hand, does have to have a precise amount of light for good colour and contrast. Dim lighting conditions tend to produce dim transparencies. Further, because colour transparencies are not so popular, film is available only from larger dealers.

Darkroom

Colour combinations

With simple colour combination techniques, you can create entirely new images in the darkroom or transform two ordinary shots into one striking picture



Tim Stephens



Just as with black and white combination prints, printing two or more colour negatives or transparencies together can enliven a dull picture or create an entirely new image. And with colour, the possibilities are even more exciting—but colour combination requires considerable skill and care.

Direct sandwiching

The simplest form of combination printing is to sandwich two colour negatives or transparencies and print them together. Unfortunately, with negatives, the orange base to the film makes it difficult to visualize the result and may make filtration and exposure difficult to the same, or at least very similar.

Combining transparencies is much easier—combination prints from slides can sometimes be simpler to make than straight prints because the normal problems with excessive contrast are reduced.

To combine two slides, remove them from their mounts and sandwich them together, preferably emulsion to emulsion, in a single glass mount, carefully aligning the images as desired over a lightbox. This combined slide can be used to make a reversal print in the normal way (pages 621 and 654). At full aperture you may find that only one slide is in sharp focus. You can, of course, use this property for effect, but otherwise stop down to at least $f/16$ in order to make sure that both slides will be in focus.

Making double exposures

Another simple method of combination printing is the process where you expose first one negative and then another on to the same piece of printing paper. The method for black and white is explained on page 361—the principles for working

Leaves and form *Combinations do not need to be complex to be effective—for this subtly attractive print, Sam Haskins, a master of colour combination effects, made a simple sandwich of two carefully chosen images*

Sam Haskins



the same, or at least very similar.

For printing, place the first negative in your enlarger and project the desired image on to a sheet of clean paper. Referring to your original sketch, trace the outlines of the image. This tracing is used for positioning the easel and sizing up the second image. It is best to start with the image which is the strongest visually as this was probably used as the basis when planning the original combination.

The next stage is to make a series of test exposures to determine the correct printing time and filtration (see pages 590 to 593). As a considerable amount of dodging may be necessary, it is a good idea to use a smaller than normal aperture for the test and combinations. However, as colour balance can be affected by stopping down, you should stick to whatever aperture you use for your

tests when it comes to the main print. Do not, for instance, later choose to use a smaller aperture in order to obtain a longer printing time without first testing the effect on colour balance.

When you have produced a satisfactory test print, make a note of all the exposure details, and mark the position of the enlarger head if the second negative is being printed at a different magnification.

Replace the first negative by the second and use the tracing of the first image to align and size the second. Repeat the test procedure to establish the correct exposure and filtration for the second negative, keeping to the same aperture. Your processing must be consistent and you may find it better to wait until this point to process the first test print also. Make notes of all details relating to exposure and enlargement for the two negatives.

Fusing the images

Next, you have to prepare some black card masks. These are used for dodging each of the images so that both fuse together in the final combination. The masks can be prepared easily and quickly by lowering the enlarger head slightly (say, 75 mm) from its marked positions and refocusing the image on the easel to produce a slightly smaller image. Place some black card in the easel and trace off the outline of the image to be removed. Use a scalpel to cut cleanly along the outline. Repeat the procedure for the second negative if necessary, and then reset the enlarger to its former height.

When you make the exposures, the

Floating castle Two negatives, one black and white (above left), the other colour (left), were printed in turn on the same sheet of colour paper. The castle was given extra filtration during printing to create unreal colour



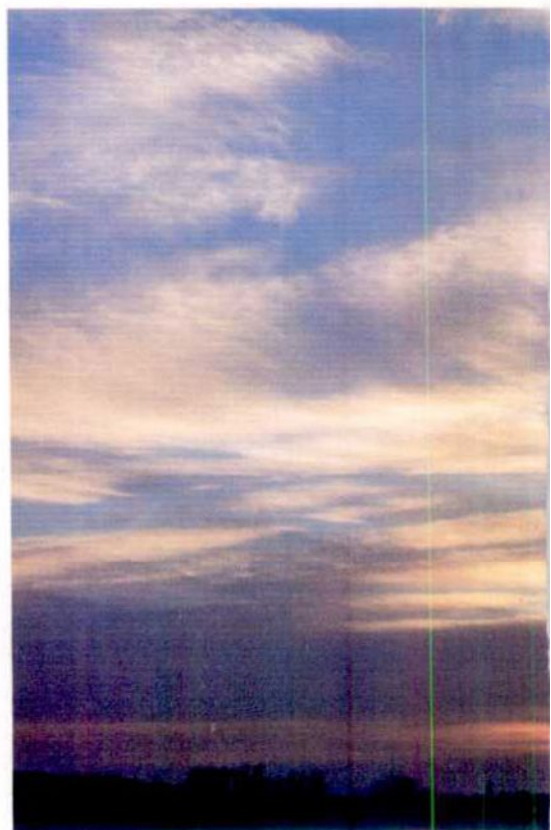
from black and white originals and colour are the same.

You can fuse one image with another to create a picture which is surreal, or simply improve an existing picture by replacing part of the image with another from a different original.

Start by looking through your colour contact prints or negatives and select a couple of images which could work well as a combination. Sketch your ideas and intended picture as this will help you decide how to frame up each image exactly, but remember to leave enough space around the critical areas of interest to allow space for dodging.

If you prefer, shoot pictures specially for the combination you want. Working to a sketch, photograph the two subjects and try to balance them in terms of contrast and density, carefully matching the lighting angles if this is important. Stick to the same batch of colour film if you have to use separate films, and process these together so that, in theory, the colour printing filtration will be about





masks are held about 75 mm above the easel and moved gently to prevent a hard shadow line forming.

To make the combination print, set the enlarger for the first negative. Any subsequent enlarger settings have to be carried out in total darkness unless you arrange a system for transferring the partly exposed paper to a paper safe and back, correctly oriented. An ordinary light tight paper box or inner bag should be suitable, but you can hide this in a drawer to be doubly safe.

Make the first exposure, lining up the mask for dodging as soon as you can. This is the most difficult part—especially with short printing times—and you can see why it is advisable to use a small aperture for printing.

As the exposure proceeds, move the mask backwards and forwards over an image area slightly in excess of the area planned for the second image. The same applies for the second exposure. The purpose of overlapping the image areas in this way is to prevent a halo effect around each image in the combination.

After the first exposure, the paper is removed and put safely away. In normal lighting, reset the enlarger using the second negative. Adjust filtration and exposure settings as necessary, and use the original tracing to accurately line up the easel. Tape this to the enlarger baseboard if there is any chance of it moving when the partly exposed sheet of paper is returned. In darkness, return the partly exposed print, making sure that it is correctly oriented and properly seated in the making frame.

Hard-edge combinations

Except in combinations which are obviously made for surrealistic effect,

the slight halo effect along the border region where two images fuse can be objectionable. You can make 'exact' combinations by constructing a printing jig as described on pages 362 to 363. An interlocking 'jigsaw puzzle' of card masks cut from a single sheet of card enables intricate combinations.

Because the glass platen of the jig tends to give prints a greenish cast, all tests and later prints must be made with it in position.

The jig is especially useful for special effect combinations of images and techniques. Instead of using card masks you could, for instance, use a series of positive and negative lith images prepared beforehand (see pages 914 to 917).

The first colour negative of your combination could be printed through the positive lith image mask (whose shadow is slightly out of focus on the easel). Then the second colour negative could be printed through the negative lith image. The result would be a perfect merging of one colour image with another, the shape being dictated by the lith image.

It follows that these lith film masks could be produced specifically to replace card masks in any combination printing sequence where precise and unobtrusive merging of detail was required.

One problem is to ensure that the positive and negative masks fall in exact register as one lith image replaces the other. For simple shapes, you may find that a simple overlap system is adequate. Align the positive and negative sheets, and carefully tape each to a different side of the printing jig, in a way that enables the used sheet to hinge out of the way. If necessary, use a thin sheet of glass to sandwich the film against the

Ruins at sunset Two pleasant but dull slides can be combined to create a strong image. A straight shot of the ruins is scenic but, with a modern fence in the foreground, has little atmosphere (above left). The sunset, on the other hand, is pretty, but lacks any real centre of interest. Two



Tim Stephens



alternative combinations (below) show the improvements that can be made. For each, the sunset sky was inverted and extra clouds have been added by dodging, which also helps to hide the edges of the two images. One was printed with natural colour (left), the other was filtered

glass platen during exposure. As this will affect filtration and the image formation, it must be left in position for the test and main prints.

Where accurate registration is important, you may have to use a pin bar on the edge of the glass platen, punching both sheets of film. For registration details see page 927.

Combinations need not be restricted to just colour negatives. Colour with black and white and negatives with slides provide some interesting combinations—and you can go further by printing on reversal material when your ideas begin to run out.

Reversal material such as Cibachrome offers a particularly effective yet simple technique for combination printing. When you place a simple mask on reversal paper and overexpose the print, the area that has been shaded can be used for a subsequent image. If everywhere but the masked area is greatly overexposed, any subsequent transparency image will only print in the space left by the mask.

As the mask could take the form of a photogram (produced by objects placed on the platen of a jig, or directly on the print surface) many interesting effects are possible if card masks and lith overlays prove too complicated.

More than anything, colour combination printing requires meticulous care and a critical attitude—a willingness to abandon combinations that do not work, or make adjustments until the effect is just right. Given this, you should be able to make high quality combination prints.

Choosing a subject

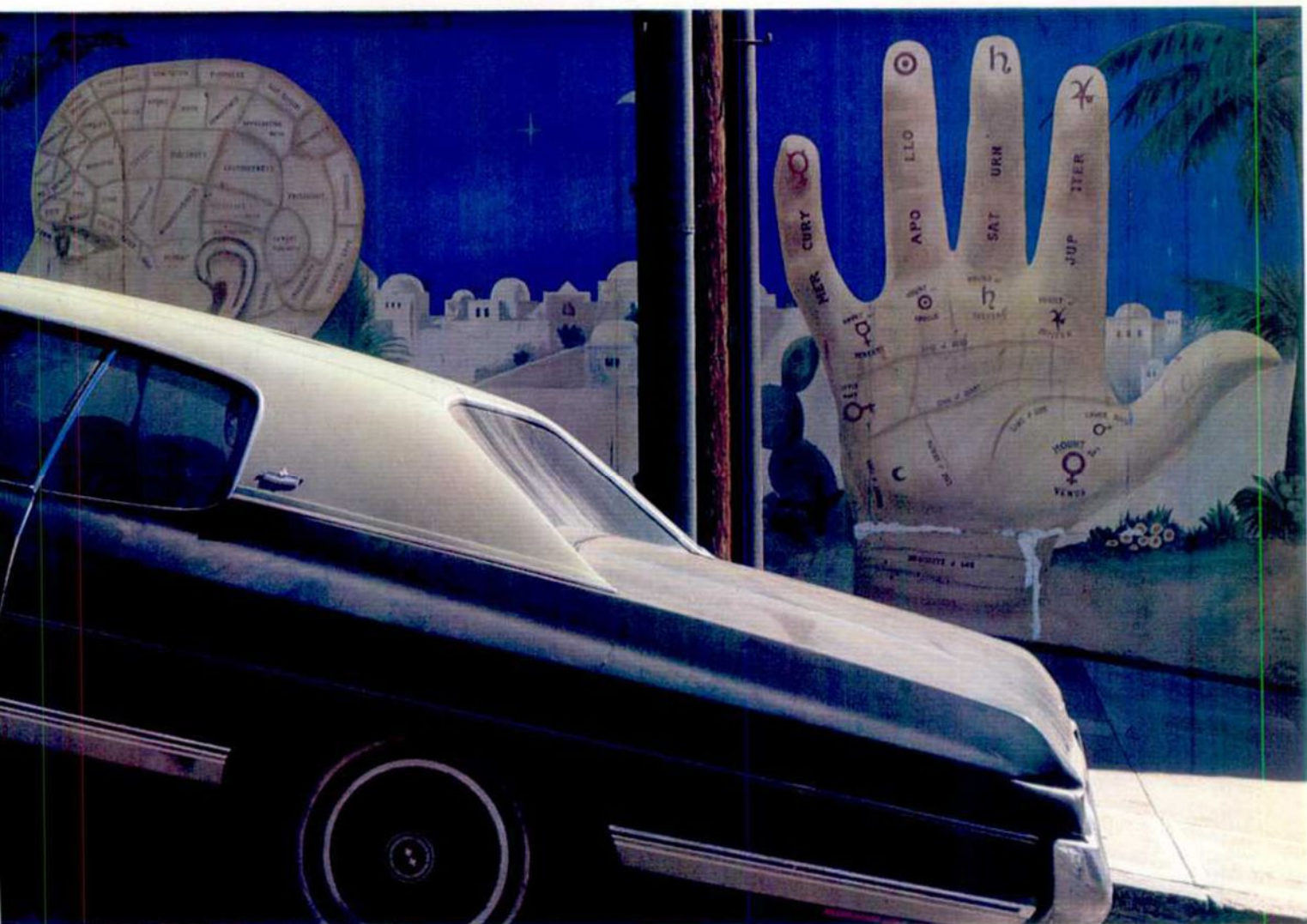
Castles in the air are easily created using the techniques described in this article. But there are many other possibilities for creating unusual effects, limited only by your imagination—and your collection of images.

One approach—perhaps the easiest for the beginner—is to use soft-edged areas of images to create a dreamlike or fantasy element. Such an effect can be used to imply someone's thoughts, or their true nature, when used in conjunction with a portrait.

The sandwiching method requires carefully selected transparencies or negatives. The Sam Haskins picture of leaves used on page 1112 is an example. The viewer is forced to look at the image carefully to find the various elements, yet the overall effect is well designed and not confused. This is an important requirement for combined images—the viewer should be intrigued, and maybe fooled, but not overwhelmed unless you are consciously setting out for such an effect.

Why create such images in the first place? Many of Haskins' pictures are commissioned for calendars. Another major use of combination printing is on the covers of records or paperbacks. For some imaginative and skilful darkroom experts, what began as an entertainment has now become a lucrative and demanding profession.





World of photography

Milan Horacek

Self-exiled from Czechoslovakia, Milan Horacek settled in Germany where he studied photography. As a photojournalist he now travels widely

Few photojournalists have had a more impressive start to their professional careers than Milan Horacek. While still at art school, he had a photoessay published in the German news magazine *Stern* and only a little later he was commissioned to do a story for one of the first issues of a new magazine called *GEO*, now world famous. And ever since he has been travelling the world taking pictures for many different publications.

Although he now lives in Germany, as he has done for many years, he is Czechoslovakian by birth and it was in Czechoslovakia that he received his introduction to photography. At the age of 18 he was working in a laboratory in Prague producing chemicals used by the special effects departments of the movie industry. Here he came into

contact with people involved in photography, and found that he liked their liberal lifestyles and generally sympathetic outlooks. After visiting a small photographic gallery in Prague, he realized the fascination of photography itself and, soon after, he bought a small camera and started taking pictures.

Two years later in 1968, however, while he was still only 20 years old, Czechoslovakia endured an experience that set the world in turmoil—Russian tanks rolled into Prague and the Russian army occupied the country. Like many other Czechoslovakian artists and writers, Horacek felt it was time to leave and before the end of the year he was on his way to Italy.

Although the memory of 1968 is now fading, and photography is thriving in Czechoslovakia, Horacek feels that he





Head and hand Stark juxtaposition of a modern car with an old fashioned mural creates a striking surreal effect

Palms and jet Another example of placing two unrelated objects in an unusual composition of contrast

Grass fire Part of Horacek's story on the Sudan. He found it one of the most difficult assignments he has had to do

can never return, because he could lose the mobility essential to him as a photojournalist. He cannot be certain that, if he does go back, he would be allowed to leave for a month or even a week at a time to carry out a foreign assignment. In the demanding world of photojournalism, this is a risk he cannot afford to take.

After leaving Czechoslovakia, Horacek spent a little while in Rome. It was during this time that he had his first picture published, in the Italian *Il Tempo*. He soon moved on to Germany, and in 1970, he enrolled on a photographic course at the famous Folkwangschule art school in

Essen. It was to affect him deeply.

Horacek stayed there for five years and says, 'It was fantastic, not only for my photography, but for seeing in general—for life.' Many photographers never have any formal photographic training, and prefer to learn from experience, but the Folkwangschule was a very different type of school and unique in the history of photography, largely because of the presence of Otto Steinert.

Although famous in Germany for the work he did in the 1950s, particularly his art photography, Steinert was also such an excellent teacher of photojournalism that he influenced an entire generation of

young photographers. Steinert's approach was ultimately very practical. He would assign his students to go out into the city of Essen to take one news picture and bring it to class the next day where it would be examined and discussed. His students developed a strong discipline in all aspects of their photography.

The very organization of the school was also stimulating—people studied a variety of disciplines there and worked in close contact with one another. Besides photography, almost all the arts were represented, and, uniquely, the school taught not only fine arts and photography but also the performing arts. The students thus had contact with creative people working in many different mediums and were also encouraged to discuss their work among themselves. It was this continual feedback from contemporaries that Horacek found one of the most satisfying aspects of his studies at the Folkwangschule.

For his final examination, Horacek made photoessays about several cities—Venice, Rome, Paris, and an industrial city near Essen. He did this report in colour and, as he says, 'in the *GEO* style before *GEO* ever existed'. The essay was subsequently published in the German news magazine *Stern* and it brought him to the attention of the *GEO* editors earning him his first commission. Since then Horacek has worked on many assignments for *GEO* and, like the magazine, has gone from strength to strength.

Most of Horacek's work is for magazines and newspapers and his brief is usually very simple although some publications give a less restrictive brief than others. *GEO*, for example, gives its photographers a great deal of freedom in the way in which they develop a story. Working for them, Horacek is usually told what the subject is, asked if he would like to photograph it, and then introduced to the writer with whom he is to work—the choice of approach is left entirely up to him.

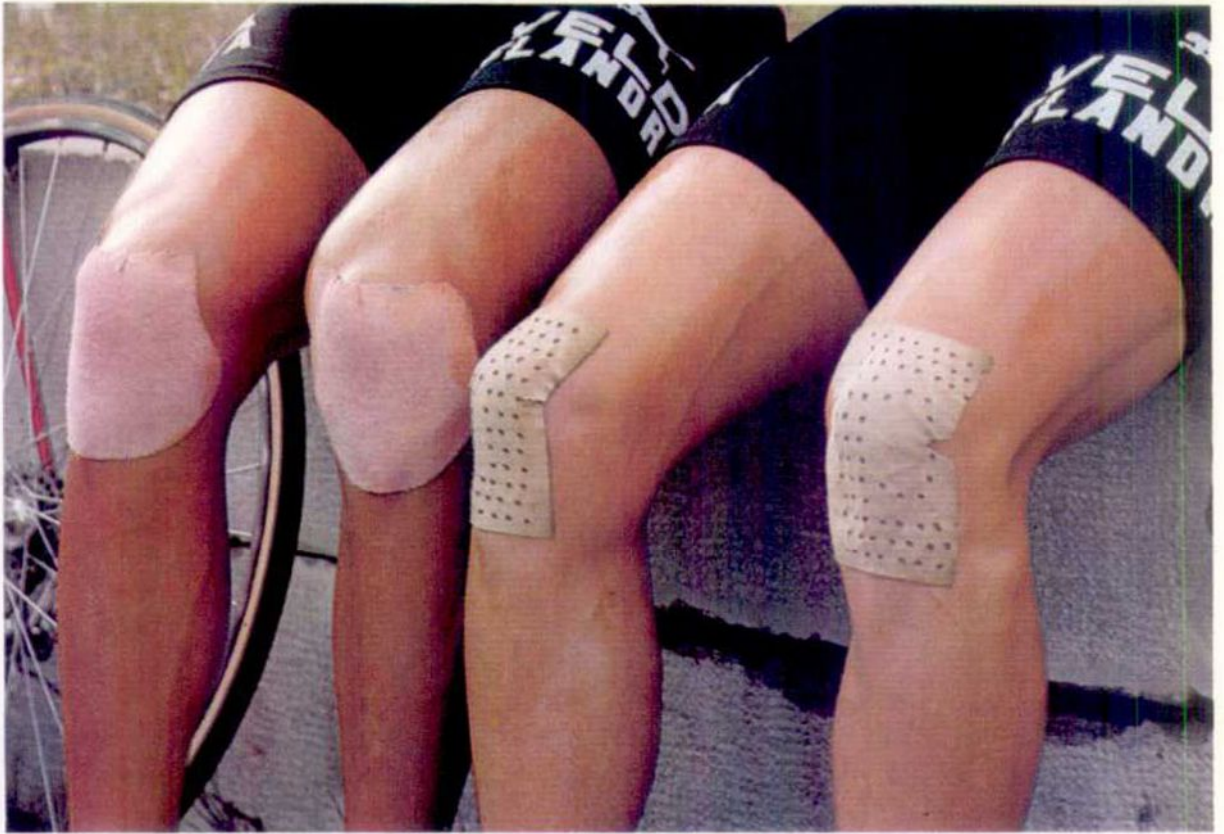
Although many photographers specialize in a particular area or subject matter, Horacek has no preferred area. For each story and each photograph, he simply tries to translate his initial impressions into visual images. He is often sent to do stories about subjects he knows nothing about beforehand.

On the first three days of an assignment, therefore, he rarely photographs anything. It takes him that long to absorb what is there and to get information



Milan Horacek





Cyclists' knees Details such as these give a clear idea of the stresses and dangers involved in long distance racing. These riders took part in the arduous Giro d'Italia

Savings bank The sign of this bank in Tucson, Arizona highlights the effect of the town's instant architecture and stresses its temporary look

about his subject matter. He feels that the most important characteristic a photographer can have is to be open to new experiences, to be able to find oneself in a completely foreign culture and to be objective enough to put by any preconceptions.

When covering the Giro d'Italia—a month long bicycle race around Italy—Horacek hired a motorcycle and driver and spent the race photographing from

the back of the motorcycle while other photographers simply concentrated on getting pictures of the winners. Horacek was after a complete story. He covered the race from every angle, including distant shots showing the cyclists dwarfed by the Alps and close-ups of the cyclists' scrapes and bruises. He was interested, not simply in the winners, but in obtaining pictures that gave an overall impression of what it means to be a

world-class cyclist.

Similarly, when he went to the Sudan, he had never been to Africa before, but nonetheless wanted to capture the feel of the place in his photographs. He did a story on the building of the Jonglei Canal in the Nile River valley. The story centred on the Dinka and Nuer tribes who were living near the site for the new canal and were being affected by the building. It proved to be his most problematic assignment.

'It was very difficult, there were no hotels in those villages and no fuel. We had nothing. We only had three weeks to do the story and spent the first two just running around trying to get a four-wheel drive vehicle and gasoline, and every day we had to find accommodation and obtain daily permits to take photographs. We didn't have any food or water and had to drink from the river, where the water was so bad that you didn't even want to touch it. But it was all there was so we had to. I became very ill and was sick for four days.'

Besides the more mundane practical difficulties Horacek also had problems in taking, and then keeping, pictures of the tribespeople. 'The Sudanese are a very beautiful people and probably the happiest people I have ever seen. But they were very difficult to photograph because they are very proud and felt that they had to show us they were important. They sometimes did this by

Milan Horacek

Wildworld burlesque A long exposure has the effect of isolating the people who are sitting together on the bench

Swimmers Horacek studied a tribe affected by the building of a new canal fed by the Nile





Bicycle race Horacek took many of his photos of the race while riding pillion on a motorcycle. He was interested in covering the race from every angle, not just in snapping the winners at the finishing line, and in conveying the feel of the entire bicycle race

sabotaging our work. Even after the pictures were taken, they would often demand to be given the films.'

Horacek hardly ever takes longer than a few weeks to accomplish any assignment. Some photographers on assignment for GEO may spend six or eight weeks on a story, but he feels that he can usually get the pictures in four.

On assignment, he usually takes about eighty rolls of film with him, all of them colour. He works with as little equipment as possible—two Nikon F2s and from three to five lenses. The most frequently used are the 35, 50, 105, 180 and 300 mm lenses but although it is always the image that determines which lens he will use, he finds that he tends to use the telephoto lenses more often than the others.

Horacek uses a minimum of special equipment or accessories. When photographing from an aeroplane or a helicopter or covering an extremely fast action sport, such as ice-hockey, he will attach a motor-drive to his camera. But this is an exception as he finds them too heavy and they use too much film.

Although he has been approached to do so, Horacek has never joined an agency nor worked on staff for a newspaper or magazine. He prefers his freedom. And besides, he adds, the freelancers are the ones who get the best assignments, not the staff.

Copying with an enlarger

Your enlarger has most of the features of a copying camera. With a little ingenuity, you can make high quality copies without leaving your darkroom

Many photographers tend to regard copying as a rather elaborate procedure requiring expensive equipment and a great deal of time and effort. But you can make high quality copies very simply using a basic enlarger and there is no reason why copying should not become routine in your darkroom.

The enlarger can be used merely as a support for the camera during copying (see pages 944 to 947), but it is often more practical to use the enlarger's own high quality optics. A slide or negative original can be placed in the enlarger negative carrier and projected on to film in the same way that a negative is

projected on to print paper to make a normal print. Large opaque originals, such as documents, can be copied by using the enlarger head as a camera—in this case the copy film is placed in the negative carrier. Although with both methods, general principles are similar to those for copying with a camera, the techniques for copying with an enlarger differ in certain details.

Projecting on to film

Basic procedure for projecting a slide or negative original on to film is very simple and is in many ways like print enlarging. As with printing, you can alter the height of the enlarger to alter the size of the image and you can produce a copy negative virtually any size you want. You could, for instance, make a large negative on lith film for contact printing on a wide variety of print material.

The original is placed in the enlarger negative carrier in the normal way and all unwanted areas of the image are masked off completely to reduce the risk of flare and awkward reflections. Proper masking is particularly important for copying work and if your enlarger does not have built-in masks, you must make your own from thin but opaque paper or card. These masks are sandwiched with the negative in the carrier.

With the original in place, the enlarger is switched on so that the standard adjustments can be made to ensure the image projected on the baseboard is the correct size and perfectly focused. Clearly, the correct image size depends on the format of the copying film.

The simplest way to use the copying film, particularly for large copies, is in sheet form. It is not normally a problem keeping sheet film flat, but it must be located accurately on the baseboard after the image has been composed and focused—with some films this may have to be done in total darkness. You must therefore have some form of jig. Some types of print masking frames are suitable for this purpose; others are awkward to use. If you do find the print masking frame unsuitable, you can make a very simple jig using two blocks of wood set in an L-shape. Further possibilities include a strip contact printer, an old fashioned single contact printing frame—even a small picture frame. Alternatively, you can use the film directly in the back of a roll film camera, or in a magazine like those used by many medium format cameras.

But whatever you use, it is essential to allow for the depth of the holder when focusing. It is also important to minimize reflections and a useful precaution is to cover the enlarger baseboard with a sheet of matt black card.

Exposure is relatively easy to determine using test strips made in the same way as for prints.



Enlarger with lights Proper copying lights evenly illuminate your subject. With this set-up, both small objects and flat originals can be photographed

courtesy Durst

The enlarger as a camera

Almost any enlarger can be used as a copying camera. Indeed, a number of enlargers are specially designed for conversion into copying cameras and there are various copying accessories available—a special 35 mm film cassette with a built-in shutter and film cutter is available for Meopta Opemus enlargers, for example.

With enlargers designed for copying work, you can see the image projected on to the film carrier directly and focusing is simple. Most enlargers, however, must be focused using the following procedure.

Place a spare negative in the carrier and mask it off carefully with the negative carrier masks to ensure that the whole image is well within the covering power of the lens—the masks must be kept in place as the copy film is inserted later to ensure the correct sized copy.

Compose and focus the projected image of the spare negative to give an enlargement corresponding exactly with the original to be copied. If the original is flat, focus the image on a sheet of white paper. This must later be replaced by the original. The focus point of three-dimensional objects can be estimated by raising the easel slightly above the baseboard.

When you have correctly focused the enlarger, lock the enlarger head in position on the column, stop the lens down to its working aperture and carefully remove the negative carrier. Take special precautions not to knock or otherwise disturb the lens panel during this and subsequent stages. On some enlargers, it may be possible to lock or at least temporarily tighten the focusing knob at the required position.

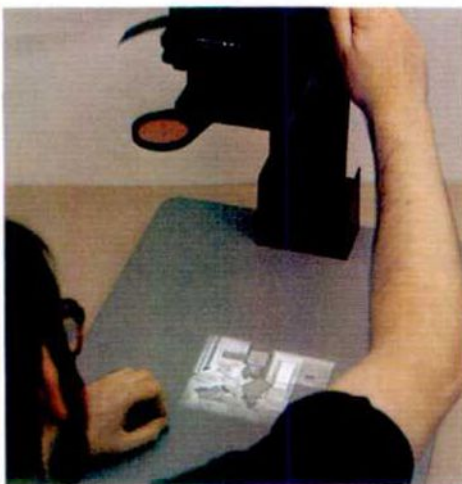
You may find it more convenient not to remove the carrier at all once the correct focus has been obtained—simply ease up the top part of the carrier to remove the focused negative, and replace this (under safelighting or in darkness) with a piece of previously prepared cut film.

You must make sure that the only light that reaches the film in the negative carrier comes from the object being photographed. To do this, tape light-excluding flaps around the negative carrier so that you can still reach the film easily. It may be necessary to tape over the light leaks, but be careful not to obstruct the enlarger cooling slots any more than necessary, so that you can still use the enlarger lamp for focusing.

Of course, for the copy photograph to be taken, the original must be properly lit. Lighting arrangements are explained fully on pages 944 to 947, but organizing a proper rig can be an annoying interruption to your darkroom work and you may find it more convenient to work in the dark and, for exposure, literally 'paint' a subject with light from a single lamp. Alternatively you could use a succession of individual flashes from a flashgun, each from a different angle.

Remember to keep the lighting at 45°

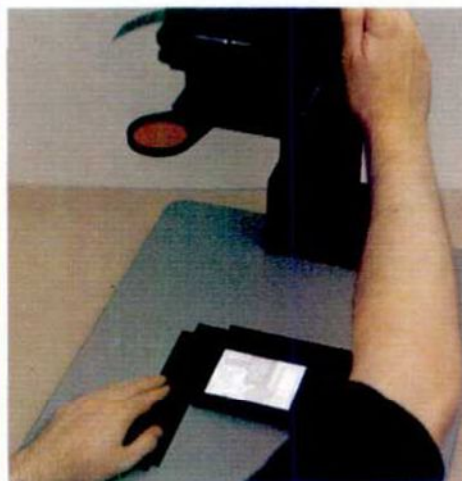
Three copying techniques



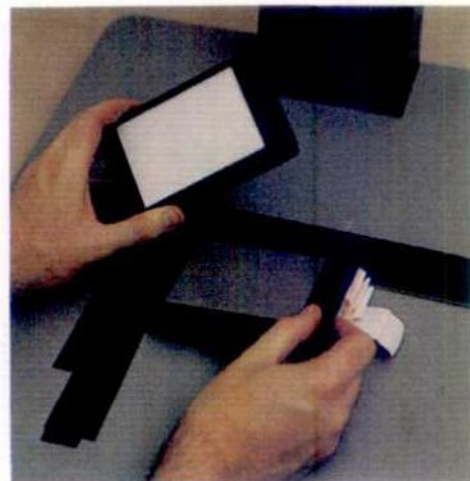
Copying on sheet film 1 The first step in making enlarged copies on sheet film is to project the image on to the enlarger baseboard. Set the desired size of the enlargement, and adjust for focus. Depth of focus is sufficient for accurate focusing on the baseboard



2 Once you have decided how large to make the copy, tape suitable strips of black card to the baseboard to form stops against which you can register the piece of film. Be sure to tape the strips down well at the ends so the film cannot slip under



Copying on Polaroid 1 Type 665 Polaroid peel-apart film gives a print and a negative 30 seconds after processing begins. Use an old film pack with a sheet of white paper inserted in the aperture for focusing and framing under the enlarger



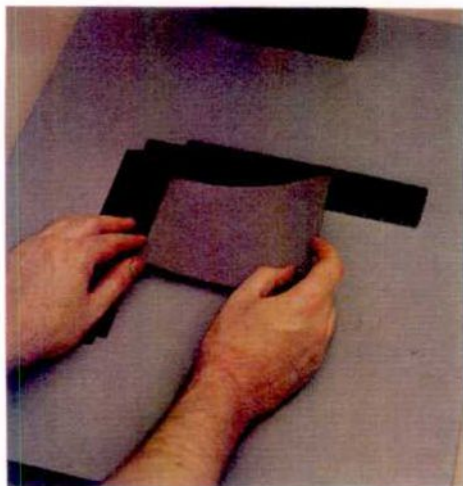
2 When you have focused the image on the old film pack, which should be registered against cardboard strips in the same way as for copying on film, take a fresh pack of film out of your Polaroid camera in total darkness. Put the full film pack in position

to—and some distance from—the surface of the original. Make tests to determine both the distance and the time a lamp should be used. If you are using a flashgun, try out various power settings and a number of flashes. You may, for instance, find a dozen low-power flashes around the baseboard give superior and more consistent results than one high-power flash on each side.

If the original needs to be backlit, any simple light box with suitable lighting can be used. Another method is to place the original on a piece of flashed opal glass or plastic, behind which a lamp—or better still—an electronic flash is positioned. Flash has the advantage of being consistent; it gener-

ates no heat, and it is suitable for black and white and all daylight-type colour films. Be sure to tape the original to the glass if it is unmounted so that it is held flat, or weigh it down with another piece of glass.

To make the copy, clean the negative carrier with an anti-static cloth and blower brush to remove all dust and marks from the glass. Under safelighting or in darkness—depending on what film you use for the copy—place a large piece of cut sheet film, emulsion side down, in the carrier—with an oversized piece of film, there is less chance of damage to the image during processing. Then carefully replace the carrier in the enlarger head. Normally, a small



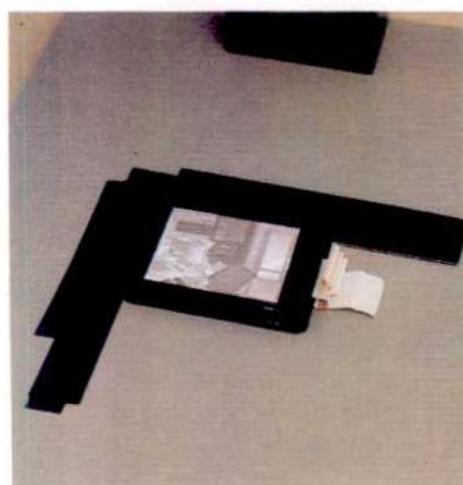
3 In total darkness (if you are using panchromatic film) place a sheet of film against your taped-down stops. If the code notch cut in the edge of the film is at the bottom left, the sheet is emulsion-side up. To prevent marks, make sure your hands are dry



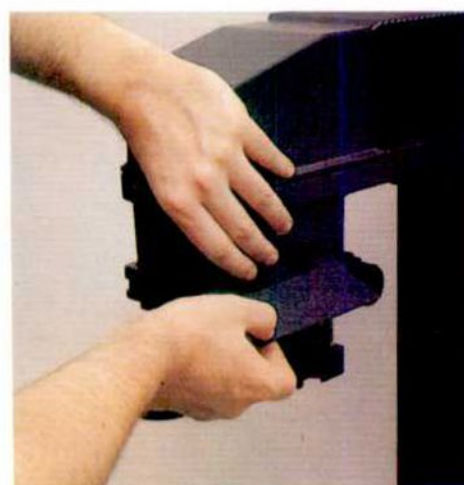
4 Use a sheet of black card to make a test strip. The technique is the same as for ordinary test strip making, except that exposure time is shorter than for black and white paper. When using a white baseboard, place black paper under the film to stop halation



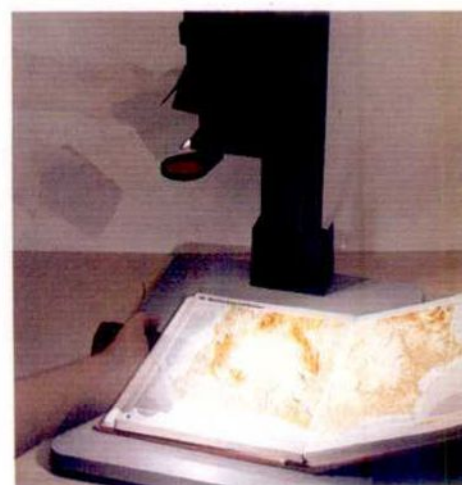
5 Once you have found the correct exposure time, make the print. The sheet of film can be processed in a colour print drum without risk of fogging. Wash the sheet and then rinse it briefly in wetting agent. Hang it up to dry in a dust-free place



3 After making the test strip, you can make an exposure. Replace the film pack in the camera or Polaroid film back, making sure that one white tab protrudes. To process the film, simply pull the tabs in the normal way for Polaroid pack film materials



Using the enlarger as a camera 1 The main problem with most enlargers when using them as cameras is light leakage. This is usually most significant around the negative carrier. To exclude light, use opaque tape to attach flaps of black paper around the carrier



2 Objects on the baseboard can be lit by making multiple exposures with an electronic flash. Carefully direct the flash towards the subject to give even exposure as you press the open flash button, then repeat the procedure from the other side of the subject

amount of vibration is allowable providing this does not cause the lens focus mechanism to slip.

Determining exposure

Exposure must inevitably be a matter of trial and error at first but by carefully noting results you should eventually be able to eliminate most of the waste. The secret is to keep your lighting and exposure conditions constant. Stick to the same aperture you normally use for printing, and use your enlarger at the same magnification for as much of your work as possible.

If you are using tungsten light, time exposures in the order of several seconds are necessary for slow speed

film. Exposures can be made simply by switching the light on and off. For even lighting with a single lamp, make part of the overall exposure from one side of the baseboard and subject, and the remaining exposure from the other—remembering to keep the lighting at 45° to the surface (see page 945).

Flash exposures are easier to estimate. You can sometimes use the flashgun's own computer to regulate the amount of exposure which is given. A low output setting enables multiple flash exposures where this is preferable to a single flash exposure.

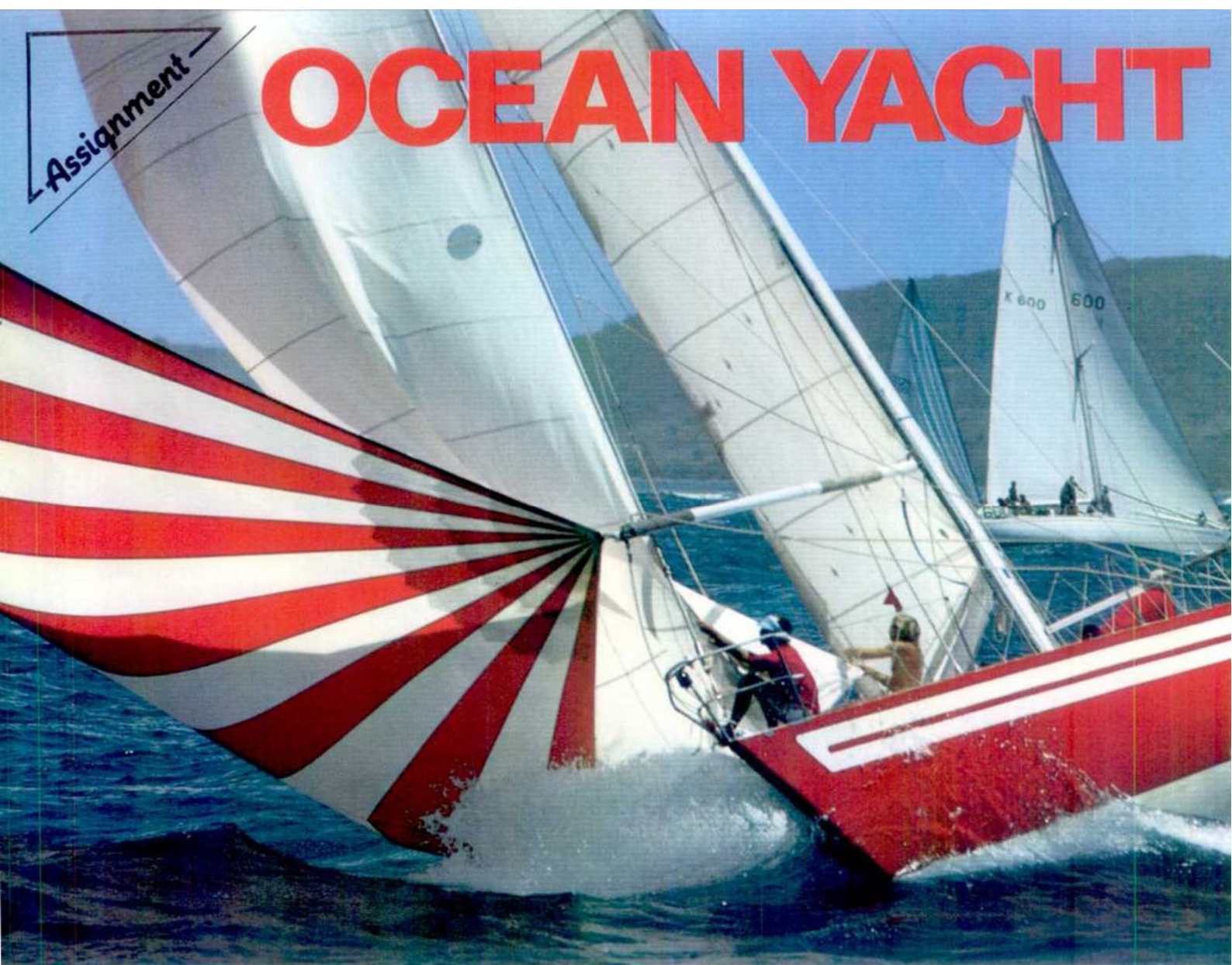
If flash is used, ensure that the baseboard is completely illuminated—you literally have to sight the flashgun to do

this. Move further away and use more flashes if even coverage is required.

Small pieces of film are not too difficult to process in dishes but be careful not to scratch the emulsion. Cut film-holders may help minimize the risk of scratching. While processing, wear rubber gloves and carefully support the film beneath the surface of the processing solution but away from the bottom of the dish. In this way, films can be kept fairly scratch free. You may find conventional film clips, attached on each side of the sheet of film, a suitable alternative method of keeping the film clear of the dish bottom. Nevertheless scratching at the edges is inevitable, and this is the reason for using oversize pieces of film.

Assignment

OCEAN YACHT



Sailing is an excellent sport to combine with an interest in photography. Here leading sailing photographer Alastair Black shows that there is more than one way to capture the atmosphere of a yachting race

Alastair Black is a leading specialist in this type of photography, and has led the way in finding new, exciting views of yachting (see pages 188 to 193). We wanted to see how he approached a particular event—Antigua Race Week—and what could be done from various different viewpoints.

Many of Alastair's most exciting shots of the race were taken from a powerboat. With careful manoeuvres, the boat was positioned so that there was a real sense of involvement in the photographs.

A great problem involved in taking photographs from a boat is that of dealing with the spray which soaks everything on board. Alastair has now developed a technique for keeping his back to the spray until the moment he is ready to shoot while also protecting his equipment inside his anorak. All lenses are protected by skylight filters but these frequently have to be wiped clear of salty water.

Whether shooting from a power boat or from a competing yacht, Alastair pointed out that another difficulty is



RACE



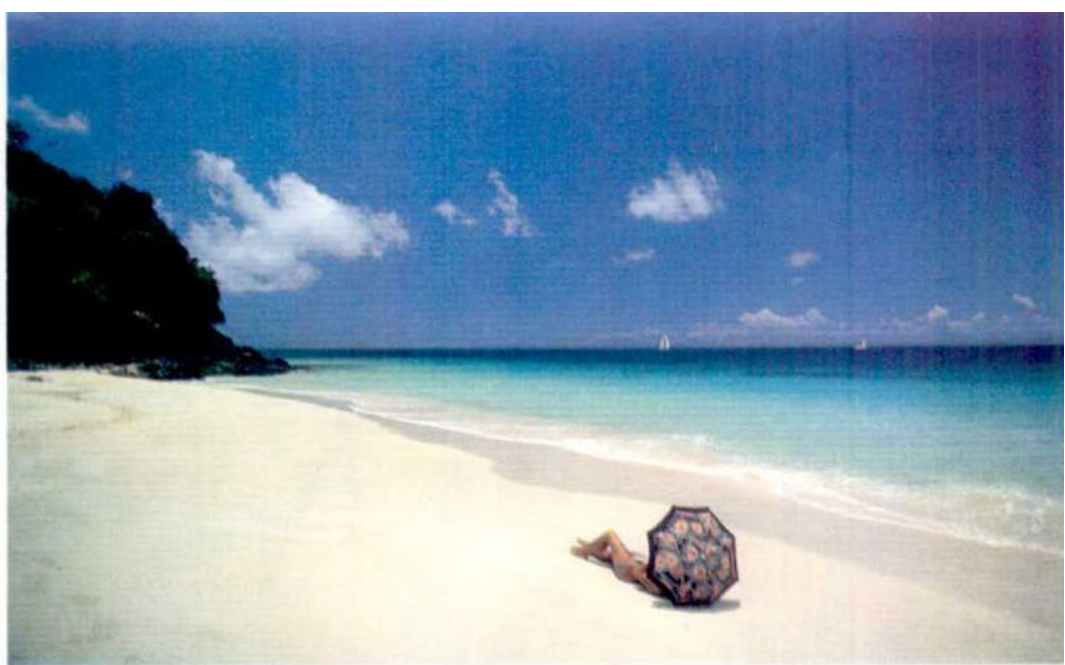
Alastair Black

keeping the horizon level in the frame. The shot of the activity on board a racing yacht shows the sort of conditions which prevail when a vessel is inclined at a 45° angle. Unless a conscious effort is made to do this you can end up with awkward looking results. Furthermore, if you do use automatic cameras for this sort of photography, you must use the manual setting. Otherwise the automatic exposure will be made for the large areas of bright spray and the rest of the image will be underexposed.

Recently Alastair has changed his favourite lenses for sailing photography. 'I used to use an 80-200 Nikkor zoom for much of this sort of work, but I found that they are slower to use and, in situations when I needed to react quickly, I was

Red and white spinnaker To position yourself correctly requires a sound knowledge of sailing. 80-200 zoom, 1/500 second at f/8. **Kialoa** Alastair waited for a foreground wave and used a low angle for more drama.

Beach scene The yachts on the horizon are used as secondary subjects which are combined with the view of the island paradise. 20 mm lens. **Group of yachts** The 105 mm lens filled the frame with the competing yachts



Assignment

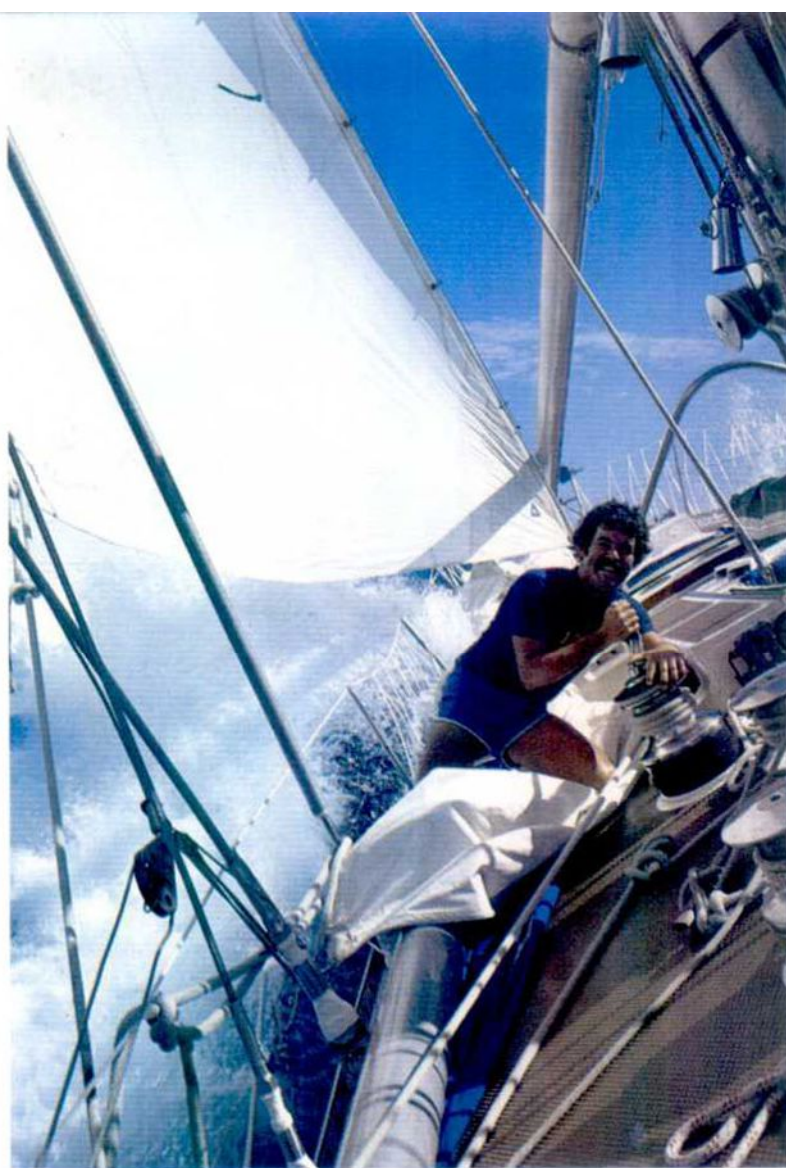
getting a number of unsharp results. Now I use an extra body so that I have one fitted with a 105 mm $f/2.5$ and one with a 180 mm $f/2.8$.

Another piece of equipment Alastair found useful in Antigua was his Nikonos underwater camera. He prefers the older meterless types—the Nikonos III—and used this camera for shooting the spinnaker flying from the water—'the low angle produces very exciting shots but you have to be careful not to get run over.'

For the aerial shots Alastair had the planes passenger door removed so that he had an unobstructed view. He varied the height for different effects. However, without a door Alastair points out that you have to be careful to keep the lens out of the current of air. 'If I use my FEs I still have to keep them on manual to be sure that they will expose for the yachts rather than the bright water around them.' Most of the aerial shots were taken at 1/500 second so there was no chance that the vibration of the aircraft would cause camera shake.

The results show the wide range of views that can be obtained at a yacht race. They also show that for really dynamic shots you really have to have the means to get right in the thick of it.

Action on deck Soaking wet and crouched in the bow of a yacht, Alastair used a 35 mm lens to fill the frame with the exhilarating action. **Bird's eye view** This shot from a light aircraft exploits the colour of the spinnaker

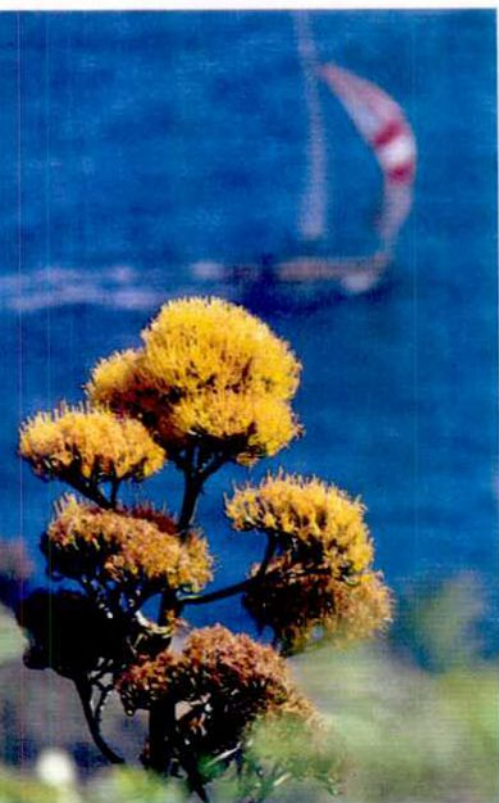


Alastair Black





Flower *It is often hard to link the yachts with the locality. Even though the background is out of focus, the yacht is still recognizable*



High flying *This viewpoint contrasts with the sea level shots. Such an angle simplifies the subject, turning the yachts into abstract shapes*



Spinnaker flying *From the water, Alastair used a Nikonos to shoot crewmembers and the spinnakers flying in the strong wind*

Photographs in print

Reproducing pictures in books and magazines is not the same as making photographic prints. The image must be broken down in such a way that the tones and colours can be printed using a limited range of inks



Image with only the cyan separation printed

In this very image-conscious world, photographs confront us everywhere we look, yet very rarely do we see 'the real thing'—nearly all are reproductions in print. It is only occasionally that the work of some professionals appears on film or photographic paper. Not surprisingly, it is the ambition of many amateur photographers to see their pictures in print as well. But just what is involved in reproducing a photograph in printer's ink?

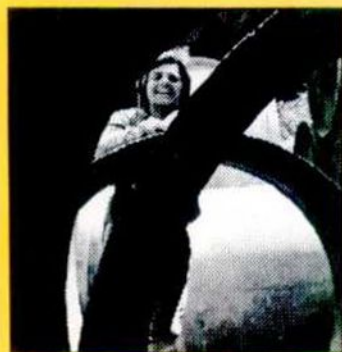
In the early years of photography, reproducing pictures was difficult. Pictures shot for newspapers or for magazines were copied by engravers. And in a few rare cases actual prints were pasted into books. But now there are many methods of reproducing photographs.

One of the main problems to overcome is the fact that a photograph has a complete range of tones and colours—it would be impossible to provide a different ink for each tone and for each colour. For reproduction, therefore, printers have to use techniques that can give the same range of tones and colours with just a few inks.

Tone reproduction

A complete range of tones is achieved by using an optical illusion. Examine a news-

paper picture very closely. You will see that the printed picture is made up not from emulsion grains but thousands of dots of black ink. Variations in tone are achieved by varying the size of the dots. Dark tones are recorded as large dots that often merge together. Grey tones contain medium sized dots. And highlights are



shown by tiny dots, or even none at all. When viewed from the right distance, the variation in the amount of black ink in each tonal area gives an illusion of the correct tone.

The first step in reproducing a photograph, therefore, is to break it down into a collection of dots. This is normally done by rephotographing the picture through a half-tone screen on to lith film. A half-tone screen generally has a grid made by



Magenta separation added

ruling two sets of parallel lines at 90° to each other. Each little square on the grid behaves as a small pinhole camera and produces a squarish dot on the lith film. The size of this dot depends on how much exposure it receives and this of course depends on the tone in that area in the original picture.

The number of screen

to 60 lines (120 to 150 per inch). Newspapers, however, use as few as 24 to 44 lines per centimetre (60 to 110 lines per inch) because the quality of the paper is not good enough to reproduce a fine screen. Large posters are often rephotographed using screens of 20 to 60 lines (50–150) but the half-tone picture is later enlarged so



rulings on the half-tone screen—and therefore the number of dots on the film—varies according to the type of printing process to be used and the quality of the paper. Like fine grain film, a large number of rulings, giving more, but smaller dots, allows finer detail to be reproduced and gives better quality. High quality reproduction demands 60 to 120 lines per centimetre (150 to 300 per inch) while magazines and books generally use 48

that the number of lines per centimetre is very low.

Colour reproduction

A similar process is employed in reproducing colour. But, in addition to breaking down the image into dots, the original must also be reduced to a basic set of colours. The principle here is the same as with colour photographic processes, particularly colour printing. It is the subtractive method (see page 590) using three main colours

—yellow, magenta and cyan.

For reproduction, *separation negatives* are made by rephotographing the original three times on to sheets of black and white film, using half-tone screens. Each exposure is made through a different filter. The colours of the filters are the primary

parent. They are deposited on a white paper base, and each colour absorbs some of the light which falls on it. Theoretically, when all the inks are printed on the same spot, the result should be black. However, one defect of the colour-ink printing process is that an insufficient

and magenta dots which combine to form red.

The half-tone negatives used to be produced using a special camera—known as a *process camera*—so that they could be made to the size required for the final print. Now this has largely been replaced by electronic scan-

such as normal text can be printed without a half-tone, as a solid black or colour.

Letterpress and photogravure are both *relief* printing methods. With letterpress (which is often used for newspapers) the ink is coated on to the raised surface of the printing plate which con-

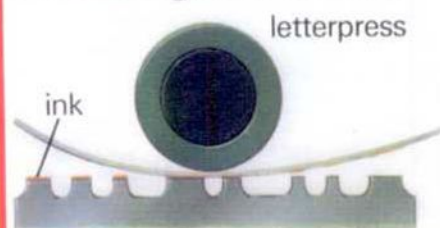


Yellow separation added to give the full range of colours



Black printer added to give a full range of tones

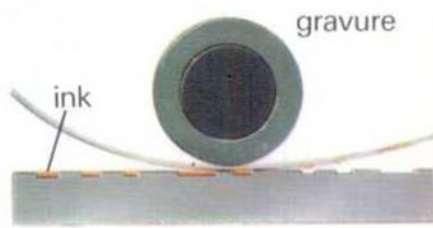
Printing methods



letterpress



lithography



gravure

Print processes Letterpress and lithography produce tones simply by a variety of dot sizes. With gravure, it is the amount of ink carried by each depression which is important

Dot screen Progressive enlargements of a half-tone picture show how the image is broken down into dots, some of which merge together

ones—red, blue and green.

The separations are then contact printed to make film positives, and these are used to transfer the image on to printing plates by a variety of mechanical and chemical methods. In this way, three printing plates are prepared. The plate which was derived from the green separation is used to print magenta ink. The 'red' plate prints cyan ink, and the 'blue' plate provides the yellow component.

The inks are semi-trans-

parent. They are deposited on a white paper base, and each colour absorbs some of the light which falls on it. Theoretically, when all the inks are printed on the same spot, the result should be black. However, one defect of the colour-ink printing process is that an insufficient

black is formed by the coloured inks. So a *black-printer* is normally made and printed in black ink, reinforcing the tones already created by the coloured dots. To understand this process, consider an area of an original photograph that is red. This is photographed through primary filters onto three sheets of black and white film. Only the red filter transmits red light, so the red filter negative is black, the green and blue negatives are clear. Positives are then made from the negatives, so that the red filter positive is clear, and the other two are black.

The printing plates made from the positives are then printed in succession and registered on the paper. The red separation plate (with cyan ink) does not print in the area that represents red. The other two plates do, however, and so print yellow

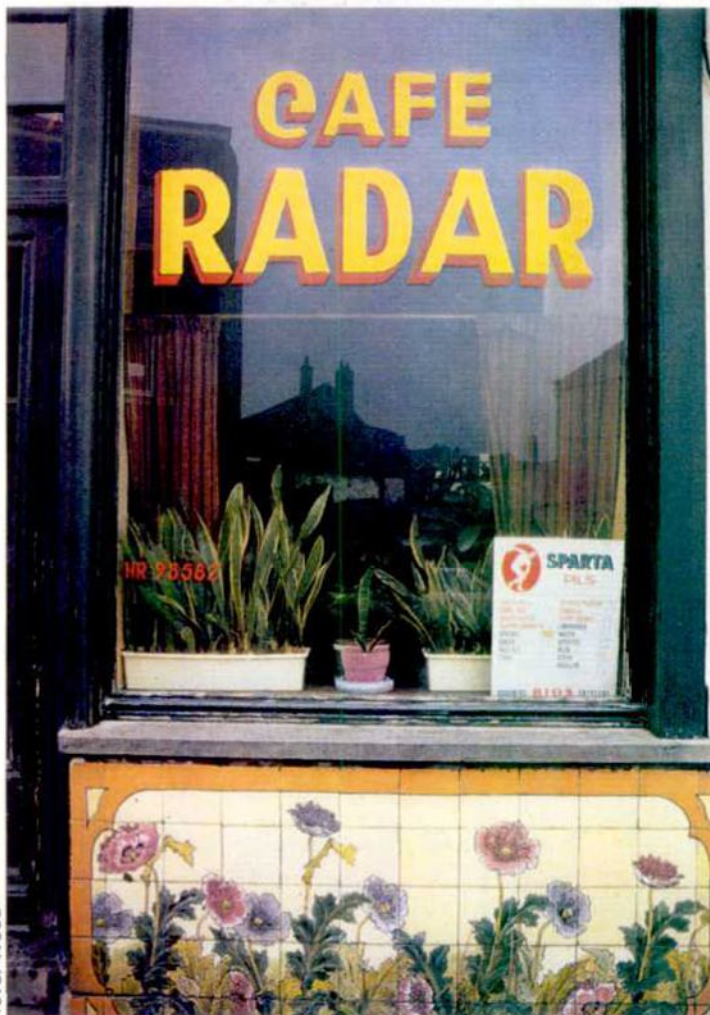
and magenta dots which combine to form red. The half-tone negatives used to be produced using a special camera—known as a *process camera*—so that they could be made to the size required for the final print. Now this has largely been replaced by electronic scan-

Printing processes

Once the half-tone separations have been made, a printing method can be chosen. The three main methods used for magazines and so on are *letterpress*, *photogravure* and *lithography*. They all use a half-tone method for middle tones, although line information

sists of the half-tone dots. With gravure, the areas corresponding to the tones are etched into the metal. Ink is applied to the plate and then scraped off the flat surface. The remaining ink, in the depressions of the plate, then forms the final image when paper is pressed on to the plate. Gravure is noted for the high quality of reproduction possible, but is too expensive for most purposes.

Lithography is the process used by many printers, including this publication's. Halftone dots are used again, but the surface of the printing plate is flat with no raised or etched areas. The image areas (the dots) are grease accepting. The plate is dampened with water, then rolled-over with ink which only takes to the greasy areas. Highlights are very well reproduced in this way, but lithography cannot print a very dark black.



Trevor Wood



Vautier/de Nanxo

Shops and markets

From the stark, high tech modern supermarket to the quaint old backstreet bookshop or the bustle of a street-trader's stall, shops and markets offer a wealth of interesting material on almost everyone's doorstep



On foreign trips, market places act like a magnet for the photographer. With all their bustle and colour, they seem to give the perfect opportunity for capturing the flavour of the place. Yet when they are at home, photographers tend to ignore the local shops and markets. This is a pity, because the scope for candid shots, still lifes, abstracts and many other types of photograph is tremendous even in the most unexotic shopping centre.

Indeed, there is such a profusion of colour and activity that it is easy to lose sight of the photographic potential.

It is therefore important to decide what interests you in the subject, and then clarify what you want to achieve. Look for a theme, such as fruit, or abstracts, so that it is easier to be selective. It may even be worth visiting your local shopping centre without a camera simply to look at the subject matter available and look for a good theme before starting.

It is often most satisfying to tackle a theme by setting yourself a project. For example, you could spend a day following the activities of one or two stalls in a market. Atmospheric pictures of the empty stalls in the dawn light could be followed by shots of the stallholders setting out their wares neatly at the beginning of the working day. Both of these photographs can be contrasted with shots of the scenes of disarray at the end of the day.

In between these times you may catch many amusing and colourful pictures of people buying and selling, as persuasion and argument lead to a sale, or sometimes to disappointment. A friendly rivalry usually exists between market people who tend to be extrovert and expressive. Watch out for humorous gestures as they haggle over prices.

Try to choose a bright but overcast day when contrast is not too great and there is a good tonal range. Bright sunlight, causing deep shadows under the awnings, can produce exposure problems, and colours can look more interesting in softer light.

Alternatively, you could concentrate on still life subjects, rather than people. Most markets and shops are crammed full of fascinating subjects for still life studies. Some of them lend themselves particularly well to certain aspects of still life. A cheese market, for example is an ideal place to concern yourself with shapes and patterns, and close-up pictures could reveal these as abstract designs.

Café Try recording those decorative shop styles which may soon vanish

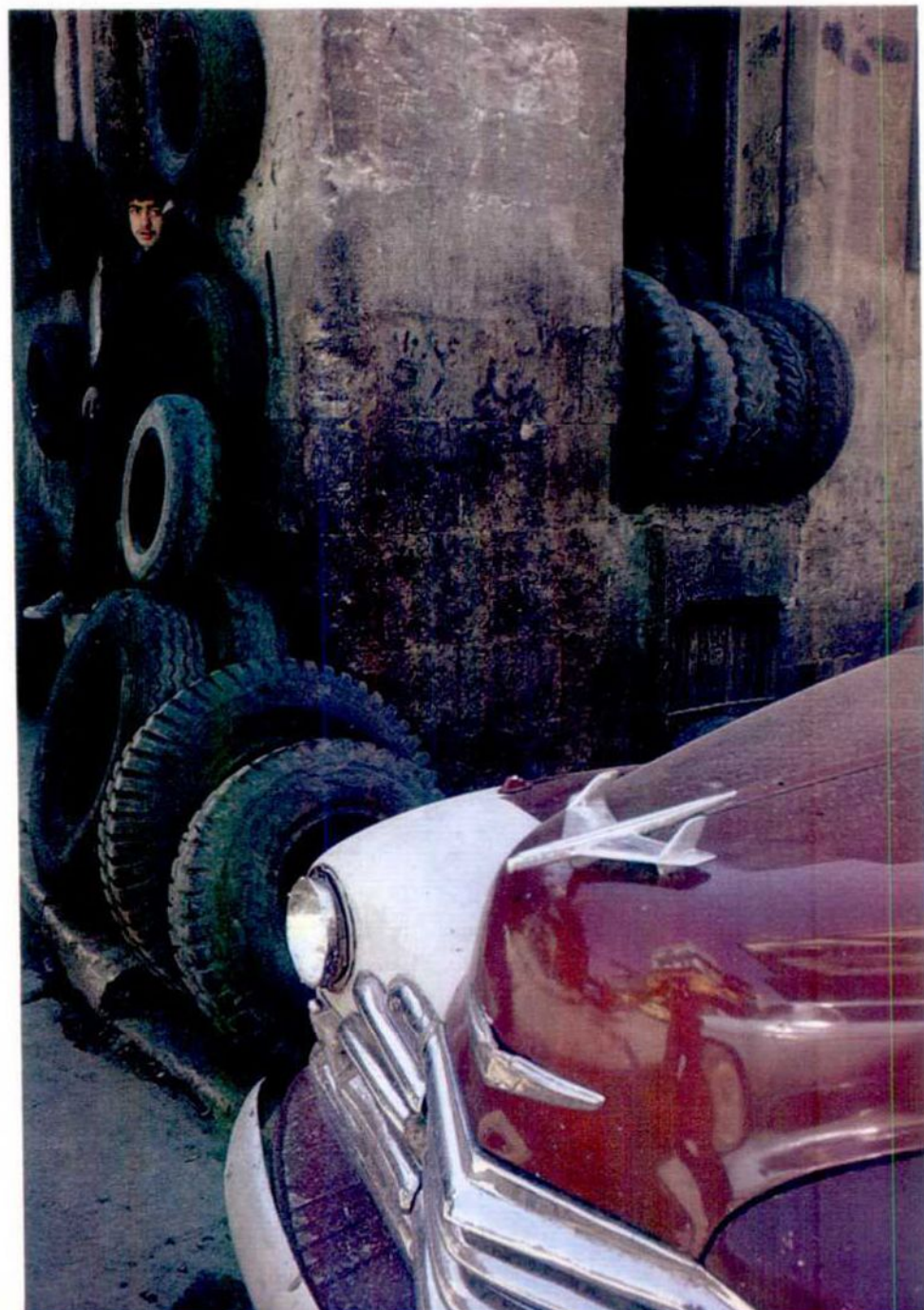
Mannequins Interesting reflections can be juxtaposed with a window display.

Night scene A panoramic camera helps show the full flavour of a street.

Jewish bakery If the shop's goods are attractive, place them in the foreground with the subject behind.

Garage A bright car brings a touch of colour to the dull stack of tyres

John Goldblatt/Vision International



George Wright



Barber This scene in Aleppo, Syria, novel to some outside eyes, makes an interesting photographic record. **Looking for a bargain** People searching through sales goods make excellent, uninhibited candid subjects



Tapdance

Old fashioned family run shops are dying out slowly, so if you know of one, it may be worth a visit. One of the reasons that these shops are so interesting is that most of the family help in the running of the shop in different ways—you could try a formal family portrait with everyone gathered in front of the shop, or a series of portraits showing the members of the family at their particular tasks.

Some shops are worth photographing because they display products of skill or craft which you may not find elsewhere very easily. You may learn something as you photograph a butcher jointing meat, for instance, or a glassblower or shoemaker at work. And this knowledge can be passed on in your photographs, giving them added interest.

Specialist shops such as these have a strong individual character which you can bring out in your photographs—an Italian delicatessen in which strangely shaped cooked meats are strung in thick clusters from the ceiling, for instance, or an old fashioned sweet shop in which rows of heavy glass jars contain assorted colourful confectionery, or a small pet shop in which the owner can be glimpsed among cages and tanks of chattering or bubbling livestock. Specialist shop owners may, in some way, resemble their goods or trade, and with a bit of persuasion you may be able to get them to pose with their wares.

Success depends on skilful composition. A rail of brightly coloured summer dresses, for instance, can look





Secondhand clothes Look out for the colourful, if disorderly, displays of old clothes shops and junk shops

very dull with a head-on shot. But the picture can be transformed if you take advantage of the geometrical pattern of the coat hangers and shoot close up at an angle.

Ordinary and familiar objects can be given new dimensions if they are viewed from unusual positions where they may, for instance, create abstract shapes.

Try to avoid isolating human subjects from their surroundings since their expressions, when haggling over prices or exclaiming delightedly when they eventually discover something they like, have much more meaning if they are related to their environment. Sometimes it is only necessary to hint at this, throwing the background out of focus or including part of a display of goods. At clothes markets you can often use the mirrors to photograph people unobtrusively.

When composing your photograph, decide what attracts you most about the subject, whether it is line, shape, colour or texture, and make this the dominant feature of your picture. For example, if the texture rather than the colour of a pile of oranges attracts your attention, position yourself so that it is strongly sidelit to emphasize the pitted skin.

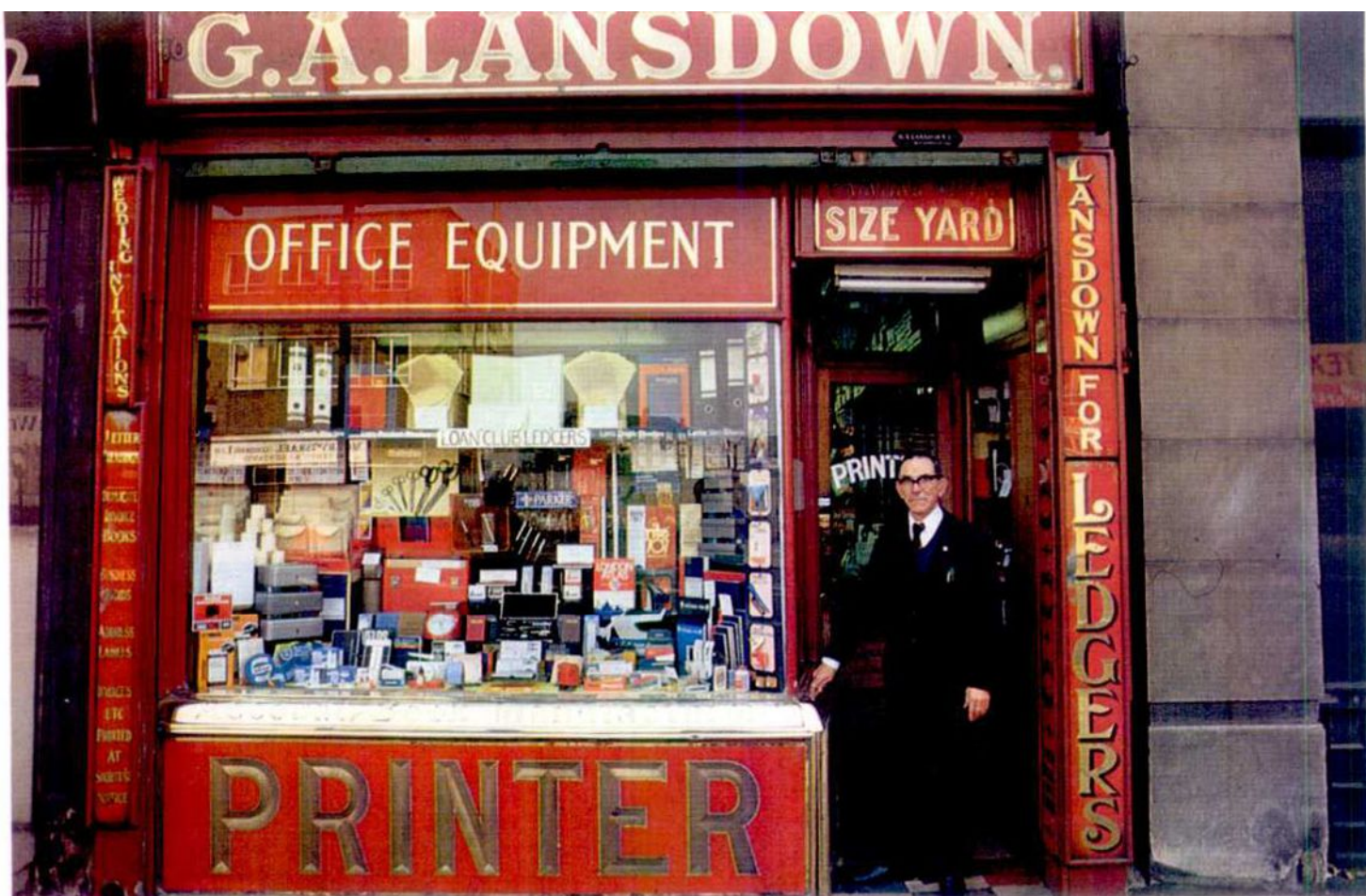
When shooting indoors try to use available light if you can as it avoids creating the disturbance which additional lighting inevitably involves. Use a fast or uprated film, and if your subjects are stationary, long exposures. Flash can be used in conjunction with natural light but you may lose some of the atmosphere which the grainy effect of fast film can give.

You can attempt to inject some originality to your photographs by seeking unusual viewpoints. Try photographing a market from a high building, for instance, so that you give an impression of activity and variety. In this way you will catch a sea of heads moving between the narrow gaps formed by the awnings. A shop interior could be photographed through the entrance which would, from this angle, act as a frame for the picture. Or you could ask for permission to position your camera inside a shop looking out through the window to catch the expressions of passers-by and window shoppers. There will be a sharp contrast between the objects inside the window and the people outside, so you will need to bracket your exposures to be certain of achieving good results.

People shopping are usually too absorbed in what they are doing to notice your camera, particularly when they are scrambling for goods at a sale. Vendors' responses will depend to a certain extent on how often they see photographers. You should always ask

Window cleaning A reflection in the window appears to set the woman behind it on fire





Trevor Wood



John de Visser

permission if you want to photograph a shop interior, and it will clearly be a point in your favour if you actually buy something, especially if it is the sort of shop that attracts few buyers. In some countries they will be willing to pose exactly as you want them, but may expect a tip.

However, very often when photographing people, it is necessary to remain unobserved. A long lens will enable you to shoot from a distance where you may not be noticed. Conversely, a wide angle lens will allow you to get very close to your subject and shoot, apparently, directly over the shoulder, while including the person in the frame. If the area is crowded it will be easy to mingle with people and photograph unnoticed in this way. Try to make a habit of being alert and attentive whenever you are in a shopping area, and have your camera ready on an automatic setting, or at least take an average reading for the light conditions.

A quick eye and a ready sense of humour can spot some amusing juxtapositions. For example, a real cat asleep among its bright eyed clay imitations, or an animated vendor selling enthusiastically to a bored looking audience. Shop window mannequins in various stages of undress are promising subjects, and people's reactions to their nudity can be very amusing.

Make use of the objects associated

Office equipment The proud owner in front of a neat and tidy shop adds a touch of character to the shot.

Traditional markets, such as this one in Madras, often provide interesting patterns of fruit and vegetables

with shops and markets. Old shops often have interesting antique signs identifying them. Plate glass shop windows may reflect their surroundings, and it is possible to create surreal effects by mingling window displays with reflections. For example, mannequins dressed in beach wear could be contrasted in a humorous way with shoppers hurrying by clad in raincoats.

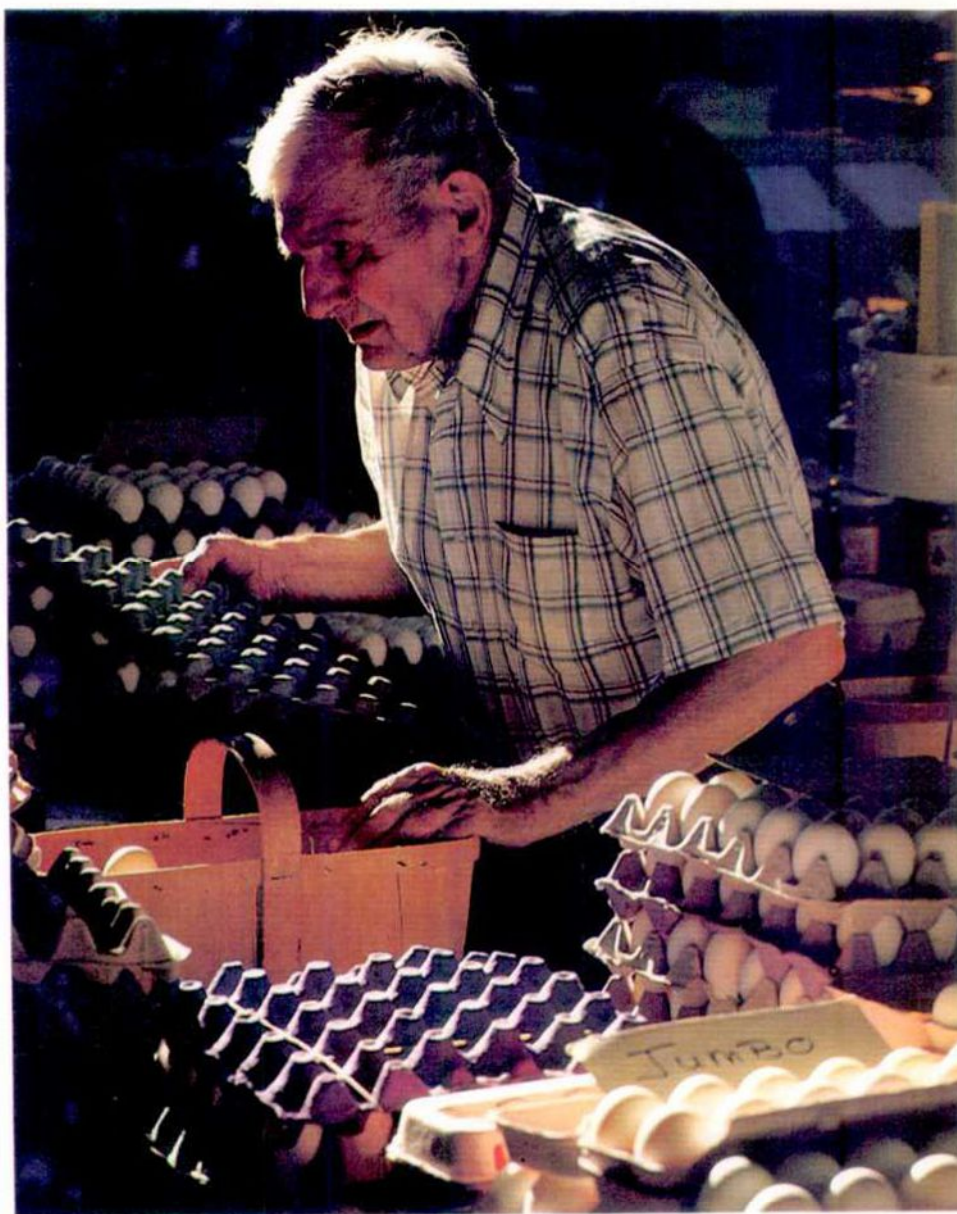
Your photography does not have to be confined to daylight hours. Winter markets often continue trading under artificial light after dark. Shop windows may be lit more evenly by artificial light than by daylight. Dusk, or early evening, is the best time to photograph as the lingering natural light will give form to backgrounds, such as buildings, roads and sky.

Different seasons can similarly add variety to your pictures. Christmas window displays are often very picturesque, especially if there is snow outside, or if their light casts a warm glow onto the faces of passers-by. Summer sales may add splashes of colour in the form of bright bargain notices to otherwise dull window displays.

Finally, you can save yourself a lot of trouble by considering carefully the time of day when certain pictures are best taken. Traffic and pedestrians can be very trying if they are constantly in your way when you are attempting to photograph a window display. If it is at all possible, return at a time when the street is less busy.

Fresh eggs Market life usually breeds interesting personalities which you can reveal in unusual light.

New York store Look above street level for shots that others might miss, such as this shopfront



John de Visser



Steve Herr/Vision International

Darkroom timers and meters

Timers and meters are extremely useful pieces of equipment to have in the darkroom. They make precise processing and enlarging simple and in the long run can save you time and money too

High quality darkroom work calls for a considerable degree of precision at every step. In particular, accurate exposure and close control of process times are essential, and for this kind of precision, proper darkroom meters and timers are invaluable.

A darkroom meter is a light meter that indicates the exposure needed for a particular negative. Darkroom timers are elaborate clocks that allow you to time exposures and processing extremely accurately.

Darkroom timers

Most darkroom timers are designed specifically either for processing or enlarging exposures but there are very basic timers that can be used for both enlarging and processing. These simple timers are resettable, and count both minutes and seconds. They may be either clockwork or electronic. The clockwork timers generally have a simple clock face with a minute hand and a second hand. They are controlled by two levers, one for stopping and starting the mechanism, and the other for resetting the hands to zero.

Basic universal timers are usually reliable, versatile and easy to operate but they cannot give the great precision of a special timer. It can also be awkward to switch on the enlarger and the timer at the same time—accurate dodging and burning-in are particularly difficult with this type of timer. For more complicated exposures, it is better to have a timer designed specifically for enlarging. And for the extra facilities offered and the greater accuracy, it may also be worth paying the extra for a special processing timer.

Processing timers

Timers especially designed for processing vary enormously in sophistication, but all have facilities for timing a series of processing steps of different lengths.

The simplest timers have a clockwork mechanism, with a removable dial into which small index stops can be inserted. As each stop turns against a feeler on the dial a bell rings and the clock stops. On this type of timer you can see when the time is up for a processing step but you have to reset the timer for the next step. More expensive versions use



Darkroom meters vary in complexity between the simple spot and integrating meters and the more sophisticated combined timer-meter

electronic circuits to display a series of times, and are usually very accurate, though this facility may not be needed.

Enlarging timers

Timers designed especially for enlarging not only time the exposure, but also switch the enlarger on and off automatically. Unlike processing timers, they usually only time intervals of up to one minute. A wide range is available, both clockwork and electronic, and all have luminous or dimly illuminated dials that

can be set in the dark. The level of illumination is bright enough for you to see the dial setting, but not so strong as to affect light-sensitive materials.

Although electronic timers have become increasingly popular in recent years, they do not show how much exposure time is left. With dial-type faces, however, you can take in this information at a glance, and dodging or burning-in is much easier because you can gauge exactly when to stop masking the print.

Some enlarger timers have an added feature which makes print dodging easier. A foot switch leaves your hands free while switching the enlarger on or off. You can thus position your hands



Dave King/timer courtesy of Introphoto

Four programs This timer can be programmed to indicate up to four different time settings. Foot switch operation leaves your hands free

Clockwork timers are accurate enough for most processing and enlarging work. The Durst is useful for timing the different stages of colour processes

Bleep timer This battery-powered metronome timer either beeps or emits a flash from its red light emitting diode at one second intervals

over the easel before you start the exposure, and this makes complicated burning-in or dodging much easier.

Dual purpose timers

There are some timers available that can be used both for printing and for processing. These dual purpose timers may be either electronic or electromechanical, and their main distinguishing feature is a dial which counts both minutes and seconds. They also have switched outlets into which an enlarger or other device may be plugged.

Although these timers are the most versatile type available, many of the

electromechanical types do not incorporate automatic resetting. This means that you must set the enlarging time every time you make an exposure. This can be especially inconvenient if you are making several prints from the same negative.

Another disadvantage of dual purpose timers is that they are considerably more expensive—a good dual purpose timer can cost as much as an enlarging timer and a processing timer put together.

One other type of timer deserves mention—the metronome. Metronome timers do not show how much time has elapsed—instead, they click at regular



Dave King/timer courtesy of De Vere & Eumig UK Ltd



Dave King/timer courtesy of Paterson



Digital timer The Philips PDC 112 plugs directly into the enlarger and switches it off automatically when the programmed exposure time has elapsed

The Jobo B-timer is set by the two illuminated dials on the front. It is directly connected to the enlarger and has a time range of 0.5 to 99 seconds



intervals, usually of one second. Print exposures are timed by counting the clicks. Some timers of this type give very faint flashes at one second intervals. These flashes are bright enough to see but not bright enough to affect paper or film. Metronome timers are not really suitable for timing processing, but they are cheap and simple, and if you only undertake a small amount of darkroom work, this kind might be a wise choice.

Enlarging meters

Experienced printers can often tell exactly how much exposure a negative needs for a given grade of paper simply by glancing at it. Few amateur photographers, however, are able to do this reliably and a test print is usually necessary. An exposure meter makes life considerably easier.

The cheapest enlarging exposure meters do in fact use a variation of the test strip principle. A sheet of plastic film bearing calibrated areas of different densities is laid on a piece of enlarging paper, and given a one minute exposure through the negative to be printed. The processed print shows a range of different exposures, usually with a corresponding exposure time printed by each strip. The time which gives the best

density is then set on the enlarger timer, and should yield a satisfactory print.

Even the more sophisticated versions work on a similar principle, but have a 'memory' which stores the degree of density you decide upon so that you can achieve consistent density in your prints.

To programme or calibrate the memory, a print with the desired density is made, and the exposure given to it is recorded. The meter can give a reading for the paper speed, and once this speed is set on the meter, it will give exposure readings to produce prints of the same density from a given batch of paper whatever the density of the negative used. The technique for calibrating

exposure meters for darkroom work is covered fully in a subsequent article.

Some meters have indicator lights which give a readout, others have a needle indicator that points directly to the correct exposure. The simplest meters have only one indicator lamp, which lights up when the correct exposure time is set on the meter scale. With some exposure meters, you work at a fixed time, and achieve correct exposure by adjusting the aperture.

Enlarging exposure meters are invariably electronic, but there are two different kinds available: integrating and spot meters. Integrating meters use a sheet of diffusing material held under

the enlarging lens to completely diffuse the projected image before it reaches the light sensitive cell in the meter. Spot meters have a small light sensitive cell for reading just a small part of the image and give a spot reading.

Generally, the integrating type of meter is easier to use because it does not need to be calibrated quite as carefully but it may give less accurate results.

With a spot meter you can obtain a correctly exposed print from a 'difficult' negative, by positioning the meter cell on a part of the image which has the density you want to expose for. Spot

meters can also be used to give accurate exposures for areas to be burned-in or held back.

In addition, you can use a spot meter to determine which is the correct grade of paper for your negative, by comparing the densities of negative shadows and highlights. In this way you can obtain prints of acceptable density and contrast from all but the worst negatives.

Because the light sensitive cell of a spot meter has to be smaller than that of an integrating meter, spot meters tend to be more expensive. The extra sensitivity of these meters is provided by a built-in amplifier.

Your needs will determine whether you choose the more versatile spot meter or the simpler, but less adaptable integrating type. You can, however, easily convert a spot meter into an integrating meter by holding a diffuser under the enlarger lens—a piece of draughtsman's frosted acetate is ideal.

Combined timer-meters

Some manufacturers produce meters which incorporate a built-in electronic enlarger timer. This works rather like automatic exposure in a camera, because setting the meter sets the timer ready for the enlarger exposure. Although these units are convenient, they can be expensive. Avoid the type which does not have provision for manual override, because these limit the exposure range with a given negative.

Simple enlarging meters help you find exposure settings for prints of a given density quickly and simply. This one has LED indicators

Integrating meters The Paterson meter (below right) gives a spot reading, so for average exposures the diffuser must be used. The more sophisticated Hauck MSA 100 is a combined timer-meter. As a timer, it can store up to nine exposure times. As a meter, it is used to measure the density of a number of points of the image on the baseboard. Up to nine measurements can be made and the values stored. It can then compute the average figure automatically.

Both the Hauck and the Paterson can also be used simply as spot meters



Dave King/meters courtesy of Polysales & Ilford



Dave King/meter courtesy of Paterson





Early documentary photography

Of the many so-called social documentary photographers of the 19th century, relatively few presented an accurate record of life as it was really lived in a straightforward 'documentary' way

The photographic record left by the Victorians is surprisingly large and many hundreds of pictures of remarkable quality survive to this day. Yet despite this wealth, there are very few photographs that reveal much about the way people lived—most photographs of people are rigid formal portraits of the subject, posed in a studio, staring stiffly at the camera. The few pictures that do show people in their natural environment are therefore all the more fascinating for the tantalizing glimpse they give into life in the 19th century.

Indeed, it is only by chance that some of the most revealing photography exists at all. When Philip Henry Delamotte took his series of pictures of reconstruction work on the Crystal Palace in London in the early 1850s, for instance, he was interested not in the workmen but



D. O. Hill/National Portrait Gallery, London

The pastor's visit Hill and Adamson took this picture of the Reverend James Fairbairn visiting the fishing people of Newhaven, Scotland in about 1845

Kitchen staff at the Imperial Asylum, Vincennes, France. Charles Nègre's picture was part of a documentation commissioned by Napoleon III in 1859



in the Palace—it is fortunate for us that the shots also happened to include the men working on the building.

Many of the photographs that were taken deliberately to document social life in the 19th century were taken not to capture life as it really was, but in a mood of nostalgia in a time of rapid change. As the industrial, urban and intellectual revolution rolled onwards, many people felt a pang for the rural way of life that was vanishing in its wake and wished to preserve it on film before it finally disappeared—a sentiment not entirely unknown today. Many of the pictures are therefore more picturesque than revealing, concentrating on the more attractive aspects of rural life.

Typical of these photographs are the beautifully composed shots of fisherfolk



Gold town Part of the unique record of everyday life in the mining towns of New South Wales taken by Henry Beaufoy Merlin and Charles Bayliss

Glasgow slums, 1868 Commissioned by the City Improvement Trust. Thomas Annan documented decaying tenements just before many were demolished

charming pictures of street scenes in Paris, which create a surprising feeling of spontaneity.

In America, Frances Benjamin Johnston recorded the achievements of post-civil war reconstruction. She photographed the activities of the Hampton and Tuskegee Institutes where selected black and American Indian youths were trained in specialist skills. Most women photographers then kept to the traditional feminine subjects of children and pets, but Johnston worked as a successful press and documentary photographer well into the twentieth century. Her approach was direct and unsentimental and the carefully posed formality of her pictures perfectly mirror the austere atmosphere of these and other institutions at the turn of the century.

The images of social scenes that were taken in the 1850s and 1860s are the more remarkable in their directness when one considers that the most important photographic movement then was that of 'pictorialism' (see page 677). The studies of English street urchins taken by the arch-pictorialist O. G.

at Newhaven in Scotland taken by Hill and Adamson. Similarly nostalgic are the pictures taken by Sir Benjamin Stone, Peter Emerson and a number of others.

Benjamin Stone set out 'to portray for the benefit of future generations the manners and customs, the festivals and pageants, the historic buildings and places of our time'. To help in this task he founded the National Photographic Record Association in 1897. This brought together photographers from all over England and Stone alone produced over 15,000 pictures of British life and customs.

Nevertheless, there were photographers prepared to show the less attractive side of society. Again, though, their aim was not necessarily to reveal the seamier aspects of life to a wider public but to document these aspects.

When Dr Hugh Diamond made a series of photographs of his patients in mental asylums in the early 1850s, he attempted to use photography as a scientific tool to analyze the outer manifestations of his patients' inner conflicts.

In the 1860s in Britain the barrister Arthur J. Munby commissioned a number of studies of working class women and was clearly obsessed by them. He was particularly concerned by the working conditions of the 'pit brow' women of the Wigan mines and the photographs he commissioned, although taken in studio conditions, are a rare and vivid record of women in their working clothes.

The positive aspects of the movements for social reform were also recorded. In 1859 the Frenchman Charles Nègre photographed the staff and inmates of the Imperial Asylum at Vincennes which had been opened as a rest home for disabled workmen. By using a small camera and a relatively wide angle lens Negre took some remarkably informal images of people. This talent also produced some



Thomas Annan/Mansell Collection



Destitute child, 1882 Dr Barnardo was one of the first to realize the high publicity value of photographs

Rejlander are overwhelmingly sentimental. This exaggerated pathos appealed enormously to Victorian taste, helped by titles such as 'Poor Jo' and 'Longing for Home', and the admiration of Queen Victoria herself.

Such picturesque scenes can hardly be classed as social documents. They are the equivalent of the popular paintings and prints of the time and give important clues to current attitudes. By helping to form 19th century taste in photographs, especially in Europe, these pictures caused major problems for the photographers who wished to record social conditions in as truthful a way as possible.

When Dr Barnardo, the founder of homes for vagrant children, wanted to raise money for his homes in the 1870s

he soon realized the power of photography to prick the public's conscience. He began to sell packets of 20 'before' and 'after' photographs of suitably photogenic children.

Although priced at five shillings—a large sum in those days—the pictures sold well. But in realizing the value of photo-propaganda Barnardo soon fell foul of the law. His accuser claimed, 'He is not satisfied with taking them as they really are, but he tears their clothes, so as to make them appear worse than they really are. They are also taken in purely fictitious positions.'

Found guilty of 'artistic fiction', Barnardo thereafter had to stick to the 'mug shot'—that time-honoured symbol of truth and authenticity which has been used in passports and police records ever since. Ironically Barnardo's own photographs were often used by the police to identify young criminals.

The majority of European photographers still seem to have been inhibited from taking photographs that showed everyday life until the late 1870s when the travel photographer, John Thomson produced a series of remarkably candid photographs of the poorer classes.

The pictures were published in monthly instalments in *Street Life in London* in 1877. However the project was not a financial success and Thomson eventually abandoned it to return to the exotic East. Thomson's pictures were unusual for the intimate way in which they portrayed people in their everyday surroundings.

While photography in Europe still suffered from sentimentality, photographers of the New World had, from the earliest days of the daguerreotype, a far more direct approach.

The documentation of frontier life shown in William Notman's pictures of Canadian lumberjacks, Alfred Burton's New Zealand photographs and the pictures of early Australian gold-mining towns taken by Henry Beaufroy Merlin, is refreshingly free of all traces of artifice.

More direct photographs of everyday life were produced in Europe from the 1880s. Freed of some of the technical restrictions of their craft by the introduction of smaller cameras and faster film photographers felt able to go out on to the streets in search of subjects.

Both Frank Meadow Sutcliffe and Paul Martin experimented with the new technique in England. Sutcliffe, a Yorkshire photographer, who took many pictures of traditional life on the coast, produced some of the earliest photo-sequences. He was also able to achieve a natural, unposed look in his photographs by carefully observing his subjects and then asking them to assume poses that would feel comfortable during long exposures of up to 15 seconds.

Wigan pit girl, 1869 One of a series of portraits taken for Arthur Munby by a studio photographer, Louisa Millard

Paul Martin was probably the world's first truly 'candid' photographer. In the 1880s and 1890s he took to the streets with his camera concealed in brown paper or in his briefcase. The images produced were highly original and showed the street life of Britain in a way that had not been possible before.

A hidden camera was also used by the photographers of the short-lived French magazine *Paris Moderne*, founded in 1896, which pioneered the use of candid photography in the press.

Towards the turn of the century, the press also began to take an interest in social documentary photographs, showing some of the blights on society in order to speed up reform.

The undoubted pioneers of this type of photography were Jacob Riis and Lewis Hine. Riis was a Dane who emigrated to the United States in 1870. Employed as a journalist he started using a 'detective' camera and flashlights to expose the appalling living conditions of many of his fellow immigrants in New York, and his books, especially *How the Other Half Lives*, published in 1890, had a major influence on social reform.

At about the same time, again largely after the introduction of smaller, light cameras, the upper class became targets for the candid photograph.



By permission of the Master and Fellows of Trinity College, Cambridge



Frances Benjamin Johnston/Library of Congress



While many pictures of wealthy people had been taken before, few revealed much about their way of life.

Two of the most able photographers of upper-class life to emerge at the turn of the century were the eccentric Italian Count Guiseppe Primoli and the French child prodigy Jacques-Henri Lartigue. Primoli travelled extensively in the late 1880s and 1890s taking extraordinarily informal pictures of the aristocratic and artistic world. He also took many photographs of people in the streets, often in a frank and amusing manner.

Today, when images of distress and horror are unfortunately almost commonplace, consumed along with the cornflakes at the breakfast table, it is hard to realize that such images were almost non-existent for the first sixty years of photography's life, or to realize the shock value that such images had when they first appeared. By World War One, however, the twin paths of social documentary had been firmly established. In the famous words of Lewis Hine: 'I wanted to show the things that had to be corrected; I wanted to show the things that had to be appreciated.'

Paul Martin/Victoria & Albert Museum

Blind beggar Using a camera concealed in brown paper or a briefcase, Paul Martin took some of the first truly 'candid' pictures of everyday life

Sailors off-duty Frances Benjamin Johnston was commissioned to shoot Admiral Dewey's fleet while it was touring the Mediterranean in 1899

Italian immigrants, 1905 Lewis Hine documented the horrors of arriving at America's immigration centre at Ellis Island to try and improve conditions



Lewis Hine/George Eastman House

Improve your technique

Fog, mist and haze

There is no way of making a murky day look clear and sunny, but there are a number of techniques you can use to reduce the effects of fog, mist and haze to a minimum, or even turn them to your advantage



John de Visser

Reducing visibility and weakening both contrast and colours, fog, mist and haze seem at first glance to present enormous problems for the photographer. Yet there are a number of simple techniques to reduce their effect and there is no reason to feel restricted by this kind of weather. Indeed, with their distinctive lighting, fog, mist and haze can provide ideal conditions for certain shots.

Fog, mist and haze all serve to scatter the light from the sun, taking the edge off fine detail and dramatically reducing contrast. While for most photographs this is a disadvantage, the soft, diffuse lighting can often be more attractive than direct sunlight, particularly for close-ups. A conventional outdoor portrait is normally better without hard shadows, and a hazy sun can be an ideal light source. It gives definite, but soft, modelling to the face. Small landscape details, such as flowers, often benefit in the same way.

Because fog, mist and haze have greater effect over a distance, they all, to some extent, enhance the impression of depth in a scene. Backgrounds are

Early morning *By exposing for the bright sky, the photographer has used the mist to hide unwanted detail, and made an abstract pattern from the trees*

Blue bridge *In thick fog, your subject may be invisible until it is almost on top of you. The answer is to move in close and use a wide angle lens*

weaker, softer and brighter, and these conditions help foreground objects to stand out more clearly. This effect is known as *aerial perspective*, and can give a valuable sense of distance to a landscape. To take full advantage of aerial perspective, compose the image in such a way that distinct elements of the scene are visible at different distances from the camera—foreground detail, trees in the middle distance and distant hills on the horizon. A moderately wide-angle lens usually helps to reinforce this effect. Any subject that recedes from the camera, such as a road, benefits from this treatment.

On a hazy day, aerial perspective is quite gentle, but in mist and fog it



John Sims

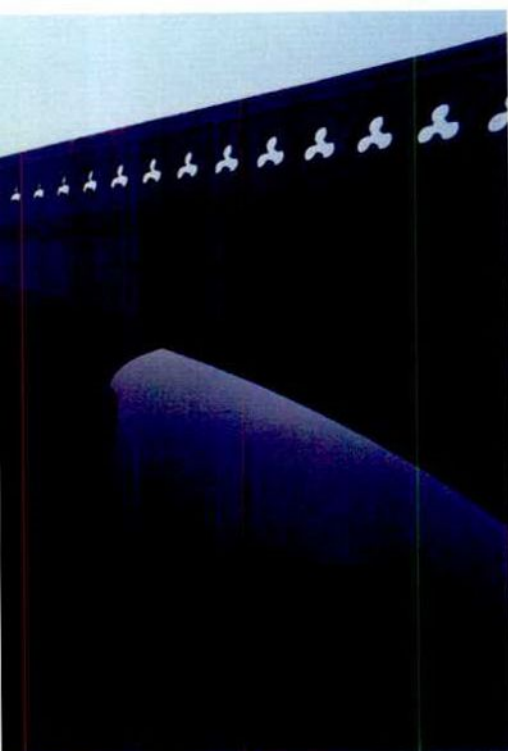
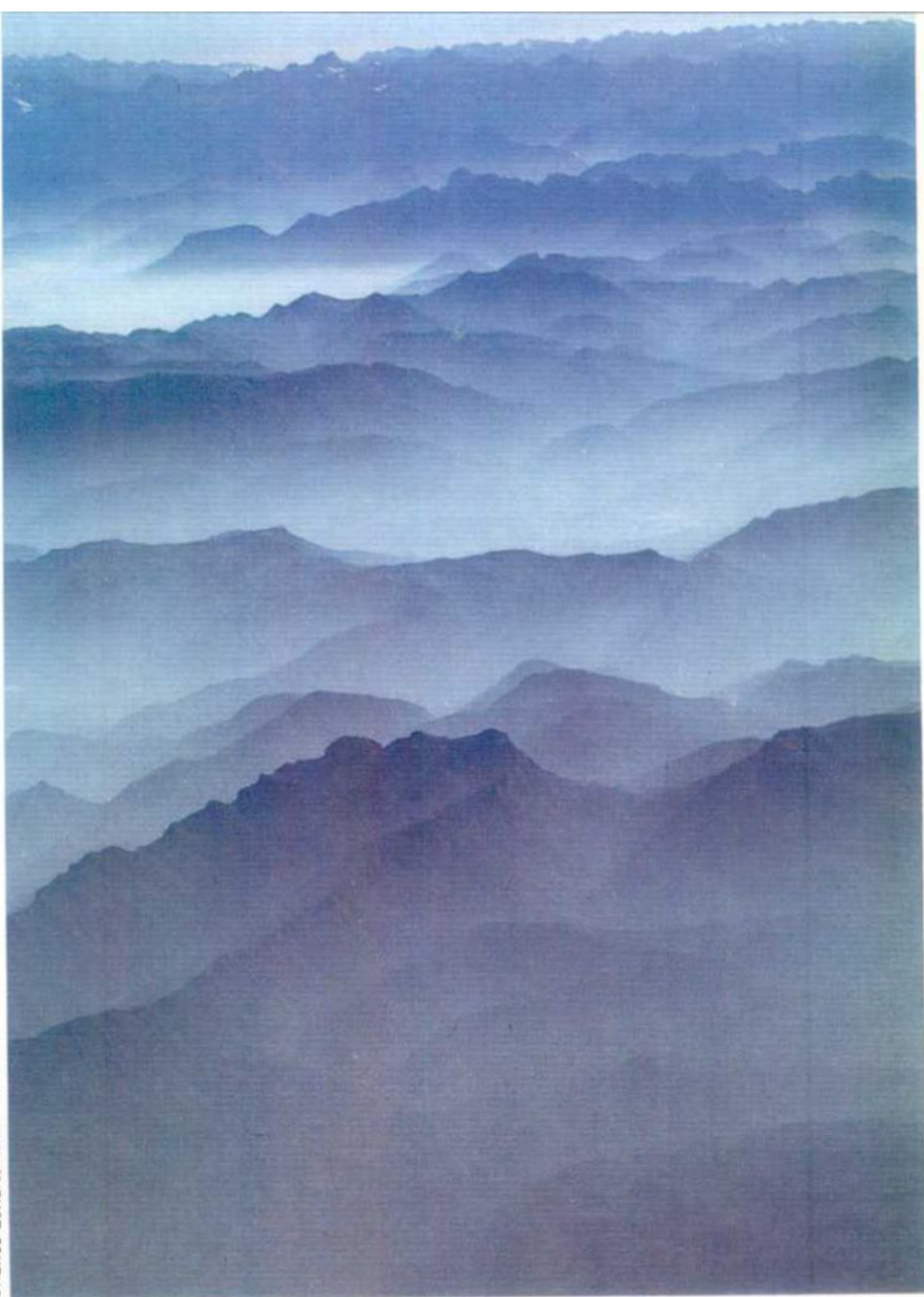
becomes so pronounced that the landscape can appear to be made up of several distinct planes, stacked in front of each other. Apart from the graphic possibilities that this offers, it has two very practical uses in photography: it both isolates and conceals. By separating objects visually from their backgrounds, fog and mist provide clear, uncluttered outlines—individual trees, for example, can be isolated within a copse to provide a strong, simple image.

This is a positive use of fog—focusing attention on one subject—but it is also possible to use fog to hide backgrounds and settings that are either ugly or inappropriate. A line of pylons running across the hills in the distance, or the smoke stacks of a factory, may be an unavoidable part of the picture, particularly if you have only a limited choice of viewpoint. Here, a light mist will conveniently remove the intrusions from the image. In these ways, mist and fog can be thought of as very selective lighting conditions, so that if you are able to choose the time and day for a photograph, they actually give you some measure of control over your subject.

One of the most attractive features of fog and mist is that, being ground-level conditions, they sometimes appear as just a thin covering over the land, so that tall objects such as buildings and trees appear to rise out of a sea of white. On a foggy day, a high viewpoint can be very rewarding, particularly when the fog is clearing and wisps drift across the landscape. Subtle tonal gradations are possible under these conditions, when the thickness of the fog or mist changes across the scene.

Telephoto haze *By using a telephoto lens, you can exaggerate the effects of mist and use it to give a strong sense of depth to a picture*

Charles Lenars/Atlas Photo



Anne Conway





Graininess is also enhanced by fog and mist, simply because they provide broad areas of continuous tone, and you can make a positive feature of this in the photograph. To exaggerate graininess, it is better to use black and white film. A high energy developer, particularly if you use it for push-processing, accentuates the grain even further, as does enlarging a small detail of the negative.

You can also emphasize grain when using colour film, though not as successfully as with black and white. Choose a 400 ASA (ISO) film—either negative or transparency—and confine the subject to the central portion of the frame. By enlarging the image more than usual the grain pattern becomes quite prominent.

If you use colour slide film, you can increase grain size in the same way as you can with black and white film—by push processing. The article on page 895 tells you how this can be done at home, but most professional colour laboratories can do it for you, provided you ask for the service when you take the film in to be processed.

There are a number of other ways in which you can enhance the atmospheric effect of fog and mist. A telephoto lens makes the conditions seem more intense, while a wide-angle lens gives a better sense of aerial perspective. Haze, because it scatters blue and ultraviolet light most of all, can be enhanced on black and white film by using a blue filter, such as a Wratten 47. An effects filter, which softens the image to give an impression of mist, is sometimes useful, and a graduated mist filter can be used to affect only the distant part of the view, making it more realistic. To lower the contrast of a foggy picture even more, you could try overexposure and under-development.

Cutting through the mist

Despite the creative opportunities that fog, mist and haze offer, there are also many occasions when they are a nuisance. This is particularly true of haze—being less definite than the other two, it offers less scope for giving an unusual treatment to a picture. However, haze is more useful to a number of photographic techniques, principally because, unlike fog and mist, it scatters light selectively. The suspended particles in haze are so small that they scatter the shorter wavelengths—principally blue and ultraviolet—more than the rest. This is why a distant horizon often appears blue. Unfortunately, films are more sensitive than our eyes to blue and

Rocking chairs Dense fog conceals ugly background detail, and you can use it to draw attention to the interesting shapes of objects close to the camera

Mist on the water Low lying mist soon disperses, so rise early. Choose a camera angle where the mist is lit from the side by the first rays of sun

ultraviolet light, so that the effects of haze are more pronounced in a photograph than in the view itself.

Filters can do much to reduce the effect of haze. With black and white film, any filter that reduces blue gives some improvement, orange more than yellow, and red most of all. But the greatest

Cutting haze with infrared

One dramatically successful way of eliminating haze in a distant view is to use infrared film (see page 794). This film is manufactured with an extra sensitivity to the invisible wavelengths beyond red—those that are least affected by scattering in the atmosphere. Infrared film is, however, also sensitive to other wavelengths, so that to get the best from it, you must use an appropriate filter. Black and white infrared film is sensitive to violet, blue and red, as well as to infrared, while colour Ektachrome infrared is sensitive to green, red and infrared—rather than blue, red and green, as in a normal colour film. Since it is the ultraviolet and blue end of the spectrum that contributes most to the effects of haze, a yellow or orange filter, at the very least, is essential.

Colour infrared film has, in addition to its haze-clearing properties, the more startling effect of false colour, particularly with living vegetation, which it records as red or magenta instead of green. Black and white infrared film, on the other hand,

can be used as a more normal substitute for regular film: with a red filter such as a Wratten 25 or 29, some of the visible spectrum contributes to the picture, but with an 87 filter, which is visually opaque, the haze penetration and the contrast are intense. In both cases, vegetation appears very bright, because the green chlorophyll in plants reflects infrared light very strongly. For exposure, follow the instructions packed in the film, bearing in mind that your exposure meter is not sensitive to infrared. An example of haze penetration with IR film is shown on page 1148.

Most lenses are designed to focus only visible light, and with infrared film you must focus a little nearer than you would normally. Most lens mounts are marked with a red dot next to the focusing index—use this as your new focusing mark.

While infrared film is ideal for eliminating haze, it actually gives worse results than normal film in fog; the water droplets are so large that they reflect all wavelengths, especially infrared.



Infrared cityscape Dust particles which scatter light and cause haze have no effect on infrared. But by using a special film and a filter which blocks all wavelengths except IR, haze can be virtually eliminated. The lower picture was taken on conventional film

effect is given by a Wratten 29 deep red filter. Unfortunately, with such a darkly coloured filter in place exposure must be increased by four stops.

With colour film, really effective haze penetration is not possible because strong coloured filters cannot be used. An ultraviolet filter helps a little, but its effect is only really obvious at high altitudes, where ultraviolet scattering is strongest. Some ultraviolet filters have a pale yellow tinge to counter the blue scattering visible when a telephoto lens is used for a distant view. However, when using a telephoto, the simplest way to control haze is to carefully choose the time of day and the viewpoint. Generally, haze is weakest early in the morning and strongest in the early afternoon. It is also most obvious with backlighting. If you have the choice, select a camera position where the sun is behind or to one side of you.

Depending on the camera position, you may find that the most effective filter is a polarizer. Although better known for its more obvious properties of darkening blue skies and cutting reflections from non-metallic surfaces, one of the most useful functions of polarizing filters is to eliminate reflections from haze particles—at least, those at right angles to the direction of the sun—and to improve contrast and colour saturation. Contrast can also be improved by using an effective lens hood.

With both black and white and colour film, you can heighten contrast further by increasing the development, as described on page 1058. If you are prepared to accept the extra graininess, the slight increase in contrast may be valuable.

Nevertheless, the most certain way of avoiding the effects of haze is to move close to your subject. The nearer you are, the less atmosphere and so the fewer particles there are in front of the camera. This means, where possible, using a wide angle lens. Also, because subtle and neutral hues make it easy for the eye to distinguish the bluish cast that is characteristic of haze, a brightly coloured subject is better.

Exposure control

Because of the light scattering effect, fog and mist can often present problems with exposure. Fog and mist generally bring an overall bright tone to a scene, so that if you follow your meter's reading unswervingly, you run the risk of an underexposed photograph. Exposure meters average the light that falls on their cells from different parts of the subject, and deliver a setting that produces a mid-toned image. If most of the picture area is taken up with white mist, the exposure that your meter recom-

mends results in an image that is grey rather than white. The solution is to decide how much lighter than average you want a foggy scene to appear, and increase the exposure accordingly. The exact amount depends on the particular situation, but generally an extra one or one and a half stops gives good results. However, if you want to capture the gloom of a misty day, follow the meter reading. If, as an experiment, you take a range of bracketed exposures of a fog-bound view, you should find that several look acceptable—what alters is the mood of the picture.

Because fog and mist tend to produce soft, muted colours, any colour cast is immediately obvious. The colour temperature of light on a foggy day is high—about 7500K—and unless some correction filtration is applied, this results in a pale blue cast. Some films produce a heavier cast than others, and all the Ektachrome emulsions look particularly cool in overcast or misty weather. The solution is to use an 81 series filter—an 81A, 81B or 81C—all of which warm up the picture and eliminate any blue cast.

Finally, it is important to look after your equipment carefully in fog and mist. The air in these conditions is heavily saturated with water, and condensation is often a problem particularly if your camera is cold. Use a soft dry cloth and lens tissues to remove droplets as soon as they form, not only from the surface of the lens, where they will spoil the image, but from the entire body; if not, water may penetrate the mechanisms. Waterproofing the camera in a plastic bag is usually unnecessary, but it is important to keep your camera in a shoulder bag except when you are actually taking a shot.

Learning to exercise some photographic control over weather conditions such as these, either by accentuating their most useful characteristics or suppressing those that you do not want, extends the range of conditions under which you can successfully take good photographs. This in turn gives you the opportunity to explore landscapes and other outdoor subjects in a variety of ways, rather than just in stereotyped 'good weather'.



Making paper negatives

Printing from paper negatives is more than just a quick and easy way of making black and white prints from colour slides. The technique allows you to produce some unique effects

The original negative-positive photographic process was invented in 1835 by William Henry Fox Talbot. This consisted of exposing light-sensitive paper in a camera, and contact printing the result to make a positive print. But, with a little variation, the basic process offers much more scope than this. With what is known as the *paper negative process*, you can make b & w prints from slides, give prints a unique textured appearance or produce a variety of interesting effects.

Paper negatives are easy to make and to print—and the final result can be toned or otherwise worked on to heighten the 'impressionistic' effect of positives made in this way.

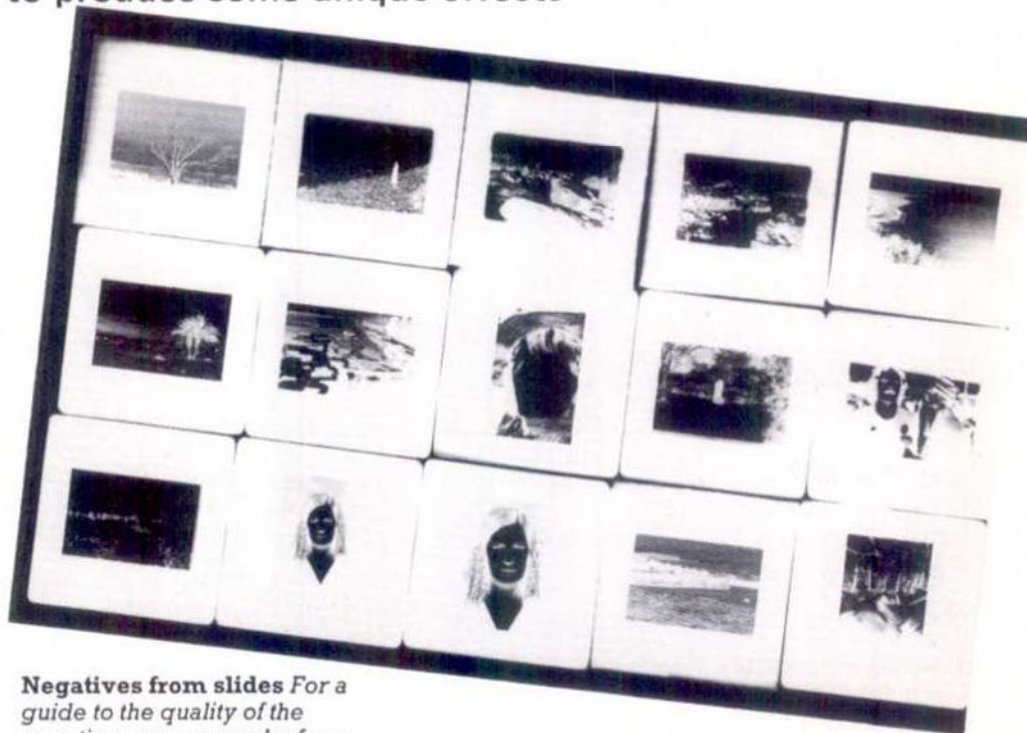
Apart from its pictorial uses, the paper negative process is a potentially valuable method of retouching unwanted detail from a photograph. It can also be used to salvage very thin and flat negatives where some sort of picture is required which would be difficult to obtain by conventional printing.

Although you can expose the paper negative directly in the camera, as Fox Talbot did, the modern technique is to prepare the paper negative in the controlled conditions of a darkroom. This paper negative is produced in a similar way to an ordinary print from a negative, and then contact printed—emulsion to emulsion—on normal or unusual printing materials to make the final print.

You can use resin coated paper, plastic based materials (such as 'Opaline'), or conventional fibre-based bromide paper for the paper negative itself. If you are using fibre-based paper instead of the now much more widely available RC materials, use single-weight paper as this transmits more light than double weight. Always use material with a glossy surface as this permits better contact between two emulsions when contact printing.

Although you can make paper negative prints of any size, larger ones are preferable if you want to preserve fine detail. An exhibition size 40 x 50 cm print is not too difficult to handle, and has the added advantage that special retouching techniques (see over) can be carried out more precisely.

In addition to normal paper and chemical requirements, you will need a contact printer or, at its simplest level, a



Negatives from slides For a guide to the quality of the negatives you can make from your slides, try making a contact sheet (above). From this you can judge which slides have the best contrast and density for printing. Once you have selected a suitable slide (below), it is easy to make an enlarged negative on resin coated black and white paper (right). You can burn-in or shade detail in the tonal range of the neg



David Hoffman



Retouching The first test print (left) is sharp and well exposed overall, but does not show enough detail in the subject's hair. To remedy this, the paper negative can be pencil-retouched on the back. If you work on an ordinary desk, right, hold the negative up to the light from time to time to check that you are working on the right areas of the image. A light box is a useful but expensive aid to this kind of work. Use soft grade pencils, an eraser and other drawing tools to achieve the effects you want. Areas that you darken on the back of the negative become lighter on the final print (lower right)

Jon Bouchier



sheet of glass and a sponge mat to keep the paper negative flat during printing (see pages 250 to 253).

Working from transparencies

The easiest method of making and printing a paper negative is to work from a colour transparency, because there is no need for an intermediate positive. The transparency is printed directly on ordinary print material to produce the negative.

You must bear in mind that most black and white papers are sensitive only to blue light or, if they are orthochromatic, to blue and green. A print of a scene containing, for instance, blue sky and red flowers will have incorrect tone values when printed. The sky will appear on the negative much darker than it should, and will print very light in the final positive. Reds, on the other hand, will come out very light on the negative, and so these will print very dark. Other colours also will be rather distorted tonally. While this can give attractive, if unreal, results—pictures have an 'old photograph' look about them—you cannot expect faithful reproduction. This is one major limitation of the process, unless you use panchromatic paper (see page 1070).

When making the paper negative, place the original slide emulsion side up in the negative carrier otherwise

your final print will be inverted, like a mirror image, when contact printing takes place.

Set up the enlarger in the usual way, and expose a test strip to determine the correct exposure for the paper negative. If you are trying the technique for the first time, aim for a stronger, lower contrast image than perhaps you are normally used to in conventional printing. This helps maintain a good range of tones.

Examine your test print by transmitted light, preferably by placing it on a light box. This helps you judge the density of the tones once you gain experience of the way the negative prints. But initially it is best to try out various negative densities by actually printing your test prints.

You may find that you have to hold back some areas, such as sky, which tend to become too dark on the negative print. All normal shading and masking techniques can, of course, be used. It is best to perform these when making the negative, as you cannot see the image when contact printing.

Working from negatives

The procedure is a little more involved if you decide to work from a negative. First you make a print in the normal way, but of much lower contrast than normal. This print is contact printed on to

another sheet of paper to produce the negative, which is used to obtain the final positive. This roundabout way of reaching a final positive image has its drawbacks. Each time an image is made, contrast increases and, to counteract this, special steps must be taken to obtain the lowest contrast possible—unless, of course, you are after a particularly strong, graphic effect.

Image quality breaks down on successive prints, and there is nothing you can do to prevent this except to reduce the number of stages where a paper intermediate is used. So unless you are using the paper negative expressly for its peculiar image characteristics—or for retouching purposes—you may prefer to make an intermediate positive on film, rather than paper, to preserve as much as possible of the original image quality until the paper negative stage is reached.

This positive image can be on lith, panchromatic or ortho materials according to your needs. The copy can be made by contact or by enlargement (see pages 1121 to 1123). If you are working from a colour negative, panchromatic material should be used. Kodak Panalure could be used for the same reason if you decide to make the intermediate positive on printing paper but you may find the maker's name, printed on the back, will show through in highlight areas—though this can be retouched out.

Retouching

One of the great advantages of paper negatives is that they can be retouched very easily. To do this, place the print on a lightbox. Retouching which is to show up sharply can be done on the emulsion side, but usually it is better to work on the back of the print. This poses no difficulty where fibre-based print material is concerned, but RC paper may need priming with special clear re-



touching lacquer spray if really elaborate work is attempted. Soft leaded pencil can, however, be used for many small retouching jobs on the back of RC prints—but take special care not to smudge or remove your retouching.

Red and black spirit pens, crayons, chalks, dyes and inks can all be used with varying degrees of success, and they are essential when retouching a resin coated negative. Any retouching on the back of the print is diffused by the base material of the paper, but harsh edges should be avoided. You can do this by 'feathering', or uniformly smudging detail using your fingers or a stump of paper.

Detail which you wish to darken in the final print must be lightened in the original. Knifework (see page 768) shows up noticeably and it therefore better to use bleach to remove or lighten detail in the negative. Lightening detail in the final print, however, is much easier—you simply increase the density of the negative image by burning-in during the exposure.

Printing the negatives

It was once common practice to make a paper negative more translucent by rubbing oil into the paper fibres through the back. This enabled really subtle tones to be reproduced. But the process is messy and not without its problems and is now rarely used. More significant is the now almost universal use of RC material which is impervious to oil. This, as well as conventional fibre-based material, can be contact printed when dry or even when touch-dry, without all the intervening fuss and bother associated with oiling.

Set the enlarger so that the light beam fully covers the area of the contact printing set-up you are using. Sandwich your own paper negative, emulsion side down, between the glass and a sheet of

printing paper. Then make a test print at full aperture covering a broad range of times, exactly as you would in normal printing. Carefully remove the paper and process this as usual.

You will find that, for a particular enlarger height and aperture setting, print exposure times will be fairly constant for most of your paper negative printing. So carefully note the settings for future use, making minor adjustments to these where experience tells you to.

When you have had a little experience of the rather drawn out procedure of producing at least one dried print on the way to printing the final image, you could experiment with short cuts. Instead of waiting for the negative print to dry, blot or squeegee this so that it is touch-dry only. Lower the damp negative print centre first on to the printing

material you are using for the final image, then sandwich it under glass to maintain good contact.

For quick proofing work—and some very strange effects—the short cut could start even earlier. At the end of development, briefly rinse the negative print in cool water and blot or squeegee it touch-dry. Continue working under safelight conditions and take the developed but unfixed print and lay it on a sheet of printing paper, centre first (this helps prevent the formation of air bubbles). Expose the negative as usual but avoid long exposures as the print will begin to 'solarize' by the end. This phenomenon can be used to create some interesting one-off images, either on the first or on a subsequent print depending how quickly image breakdown and fogging occurs.



David Hoffman

Country church

Trevor Wood shows how a simple country church can provide as many varied pictures as a cathedral, given the right approach



Trevor Wood

Trevor Wood is well known for his landscapes and views of English rural life. In this line of work he is always on the lookout for possible locations—like the attractive Norman church featured in this assignment.

Before he even started taking photographs, Trevor walked around to find the best aspects of the church and the best angles from which to approach them. In the opening shot on the left it can be seen that Trevor wandered quite far away from the church itself to take one of his shots. It shows that to photograph something like this, you do not necessarily need to get very close.

This first photograph features the church as part of the landscape. A low viewpoint has been adopted so that the reeds in the foreground fill half of the composition. It avoids the effect often created by taking relatively wide angle landscapes—that of a lack of immediacy and of the view being pushed away from the camera, with plain expanses of sky. Since there is plenty of detail in the foreground area—the reeds and the river—Trevor composed the shot so that the horizon was well towards the top of the frame. The careful use of viewing angle also makes the river recede more directly to the main area of interest—the church itself.

Having set the scene, Trevor was then able to move in closer, photographing both the church as a whole and details of the interior.



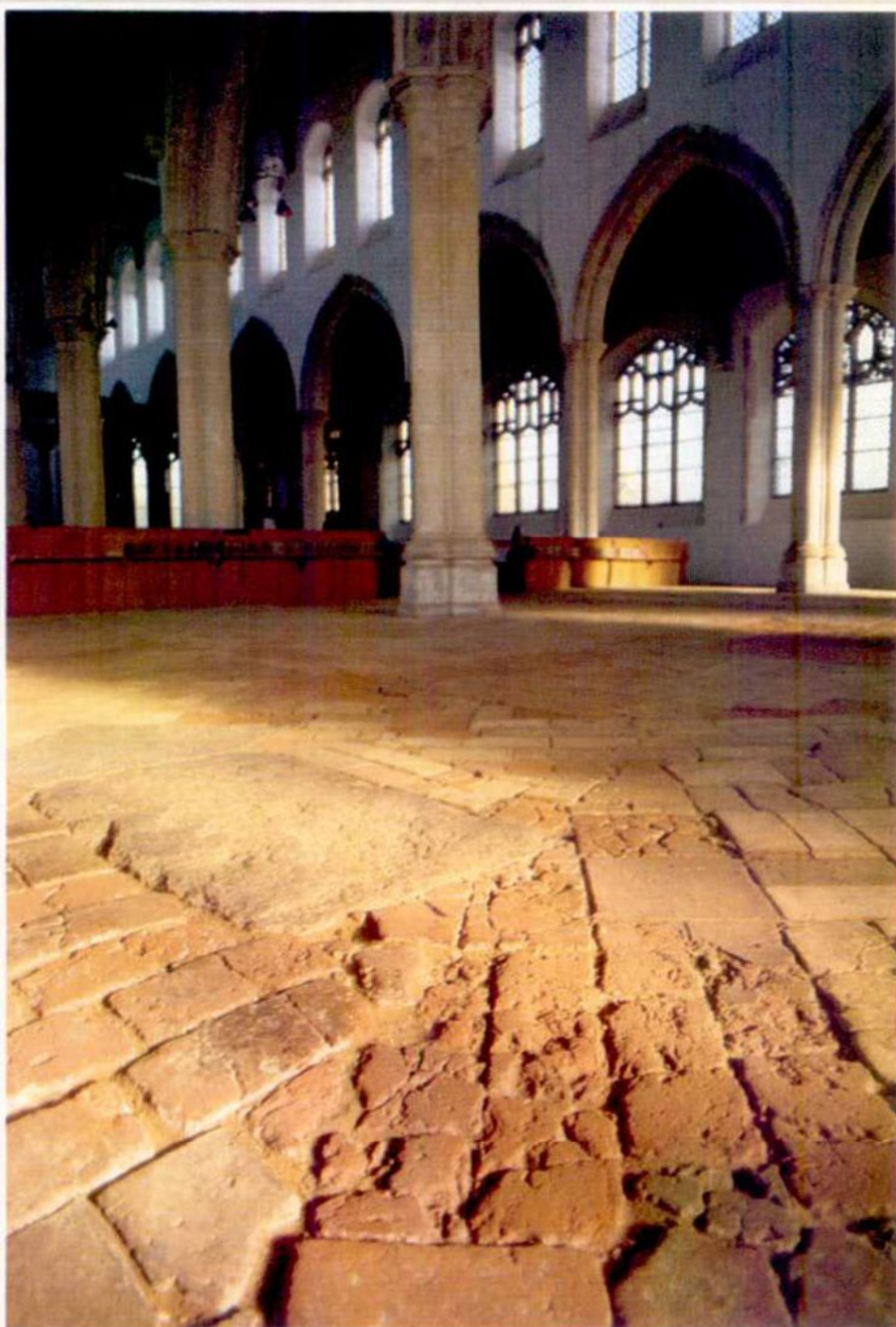
Thanksgiving arrangement For shots like this, plenty of depth of field is needed to ensure that everything in the frame is sharp and that the contrast in textures would be appreciated in the final image. To do this, Trevor gave a five second exposure so that he could stop his 50 mm lens down to $f/16$. He included some stonework in the foreground so the display was still related to the ecclesiastical setting





Reed gatherers In the opening shot of the church at a distance, you can just make out the reed gatherers in the background. However, in this closer shot (left) the workers are strongly featured. Apart from creating foreground interest, it also has the effect of combining the traditional annual activity of gathering reeds with the traditional communal symbol of the church. **Interior** Trevor took one photograph of the arches and the windows and another one of the rich colour and texture of the floor. He also shot both features together. For this it was necessary to think carefully about what to focus upon—even though this was taken with a 24 mm lens which has a wide depth of field. Trevor knew that if he focused on the background, the stones of the floor would appear disturbingly out of focus

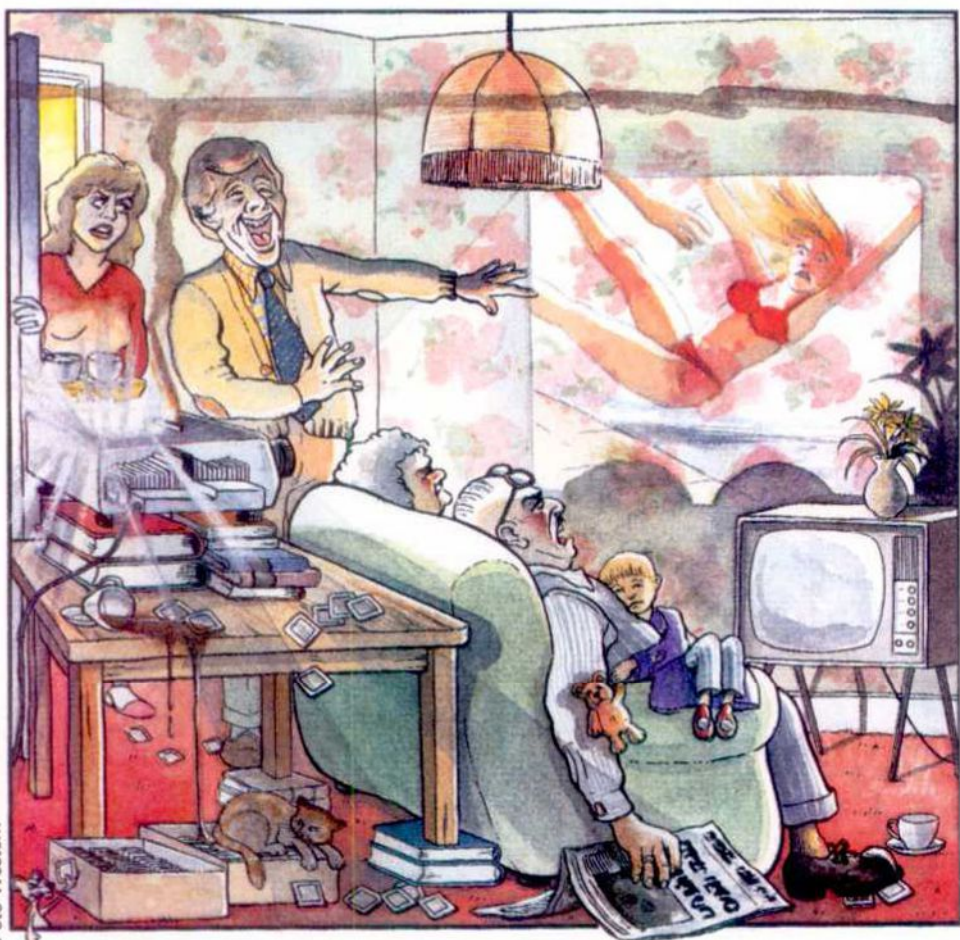
Evening light For a more atmospheric study of the exterior of the church, Trevor waited until early evening so that he could make use of the warm light from the sinking sun. It reflected off the masonry and cast long, dark shadows, investing the photograph with an eerie presence. The combination of weak evening light and slow transparency film—Ektachrome 64—meant that a tripod was needed for many of these photographs to avoid camera shake which is inevitable at the slow shutter speeds



Improve your technique

Better projection

The way you project your slides can be more important than you think—bad presentation can ruin a slide show, however good the pictures may be



While colour prints are ideal for passing around among friends, slides are sharper and brighter and give more natural colour. All too often, however, the superior quality of slides goes unnoticed, viewed against a bluish window or an orange table lamp. For your slides to be seen to best effect, they must be projected on a screen in a darkened room and made into a properly prepared and presented slide show.

The first priority is to ensure that the room for the show can be properly blacked out. Although stray light has little effect on the bright highlights of a projected image, it makes the shadow areas seem washed out and pale, and generally reduces the contrast of the picture. This can ruin slides where shadow detail is important, and even contrasty slides with a good range of

tones look much more pleasing if the room is totally dark and does not have light leaking in everywhere.

For this reason, most slide shows are held at night, usually with any curtains drawn to keep out light from street-lamps. If you intend to show slides during the day, you must take special measures to black out the room in which you normally show your slides. Shutters, blinds and thick curtains all help to black out windows.

When you are blacking out a room, do not neglect the projector itself. Every projector has grids or slats in the casing through which warm air from the bulb

Clearer colours A poorly blacked out room can drain all the brilliance from your slides. Try and eliminate as many light leaks as you possibly can

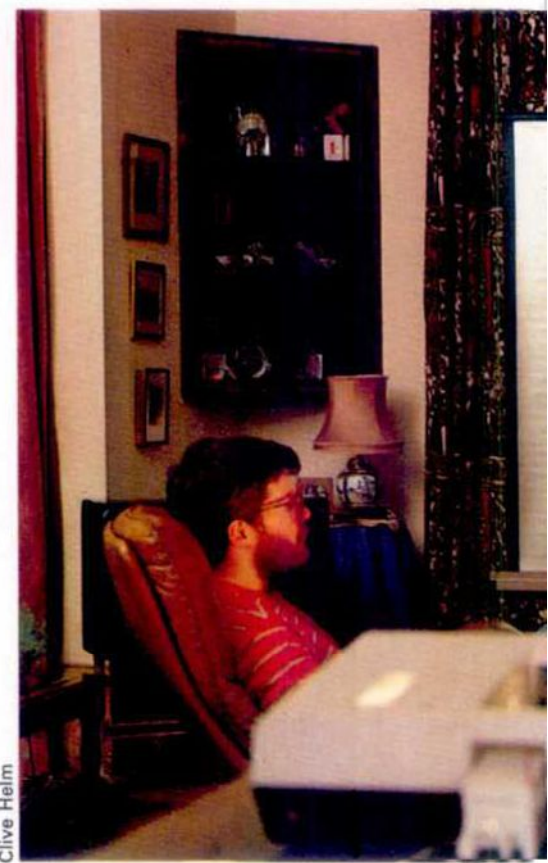
can escape, and in modern projectors these grids are either carefully baffled, or a long way from the lamp. Older projectors, or those cooled by convection currents, may not be so well sealed against light leaks. Ventilation holes must not be blocked or the projector will overheat, but there are other ways around the problem.

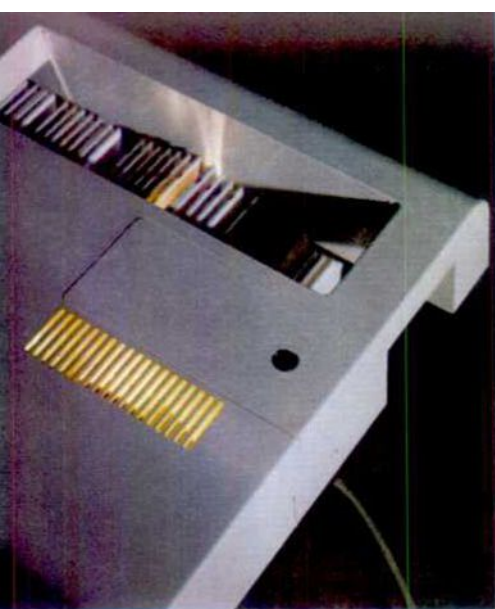
If light leaks from the top of the projector, a sheet of black velvet or card pinned to the ceiling may cut down on the light reflected on to the screen, but if the light leaks are severe, more radical measures may be necessary. Putting the projector in a cardboard box with holes cut for the lens and controls will certainly eliminate stray light, but you must make sure that enough air reaches the projector to prevent overheating.

If you cannot black out your screen room successfully, you may be able to partially compensate by increasing the brightness of the image on the screen, giving greater contrast between washed-out shadows and highlights. The simplest way to increase brightness is to move your projector closer to the screen, concentrating the light, but if you are showing your slides to more than a couple of friends, this solution is not the best as it produces a small picture.

If your projector has a power control which allows you to set either half or full power, make sure that it is set to full power—this helps to increase contrast in a badly blacked out room. Do not be tempted to leave it set on full power all the time, though, as this reduces lamp life considerably.

If your projector is fitted with a low wattage bulb, you may be tempted to fit a more powerful lamp. This is not





Light spill A badly baffled projector can add significantly to the level of ambient light in a projection room

can be seen by viewers sitting at a wide angle from the projector-to-screen axis, although at wide angles to the screen the image looks uncomfortably distorted. Often, though, a suitable expanse of wall is not available, or it may be too difficult to store a large piece of uncrumpled white paper.

Positioning projector and screen

When you are setting up a slide show, choose a room that allows plenty of space to move around. Position the screen so that it faces away from any source of light leaks—this usually means placing it against a window.

If you are using a screen which reflects light in a narrow cone such as lenticular and beaded screens, make sure that everyone in the audience sits in a position where the projected picture is clearly visible. This usually means putting seats in the centre of the room, close to the axis of the projector lens.

The projector should be placed on a firm base at the same height as the middle of the screen. Household tables are rarely high enough to get the projector far enough off the ground, and obtaining the extra height is sometimes a problem. A stack of telephone directories, or a chair placed on a table are not really stable enough. If you have a stepladder of the right height, you may find that this makes an excellent makeshift stand, provided the platform is big enough. If you frequently project slides, a purpose-built projection stand may be

a worthwhile investment.

Every projector has an adjustable foot, and some have two. These are for ensuring that the projector is level, not for raising the front of the projector if it is too low. Tilting the projector upwards excessively distorts the shape of the image on the screen, so it is wider at the top than at the bottom, and makes it impossible to focus—either the top or the bottom is sharp, but never both. Ideally, the projector should be completely level and arranged exactly square to the screen.

The distance between the projector and a screen depends on how large you want the image, and on the focal length of the projector lens. Long focus lenses form smaller images, and are suitable for large rooms. The chart on page 335 shows how far a projector must be placed from a 1.5 m wide screen, if the projected image is to fill the screen. For a larger screen, the projector must be proportionately farther away. For example, to form a picture double the size—three metres wide—the projector must be twice as far from the screen as the chart shows.

Avoiding distractions

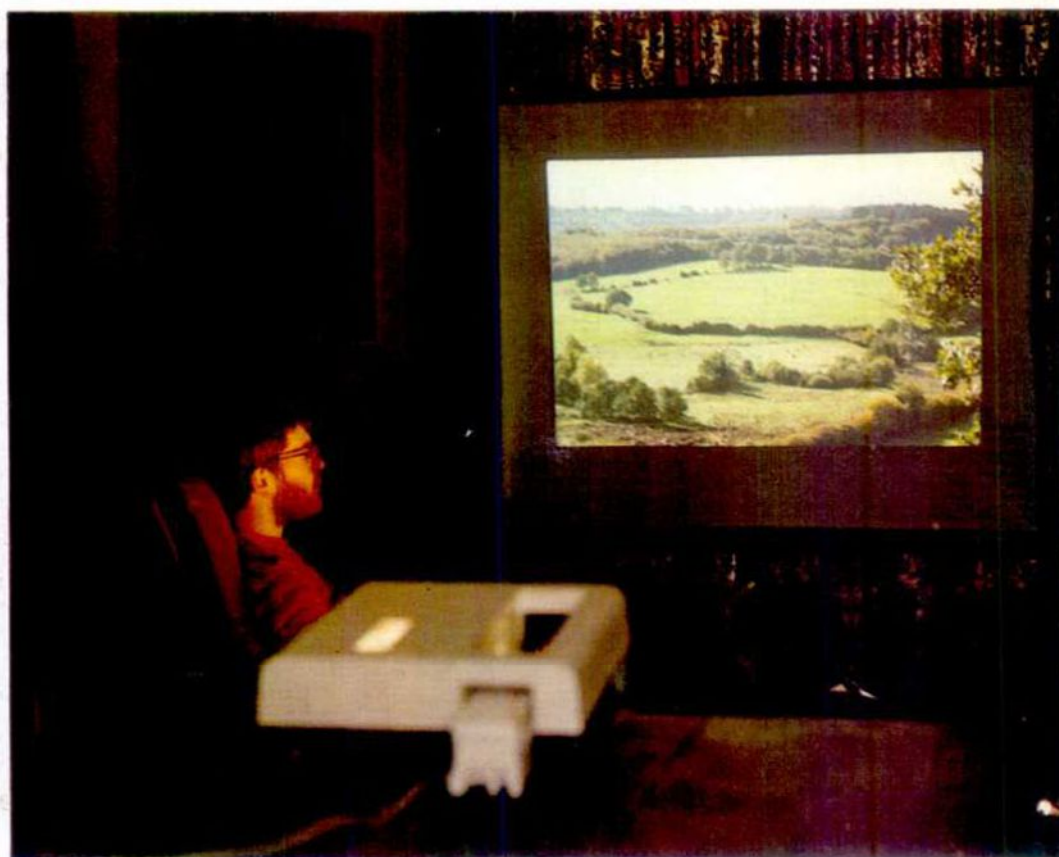
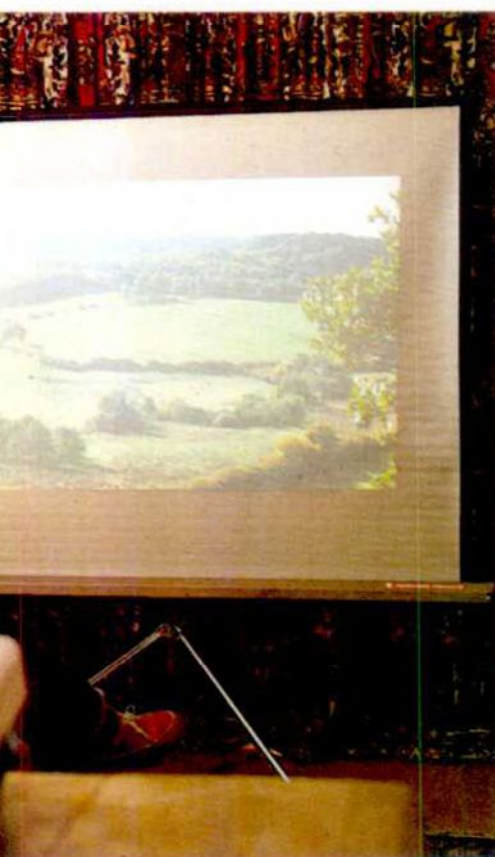
Before you show your slides, you should make sure that as many distractions as possible have been eliminated so that your audience can give their undivided attention to your pictures. It is a good idea to prepare everything well in advance and have a rehearsal before your audience arrives. If your slides have cardboard mounts, check that none of them are damaged or have bent corners that are liable to jam in the projector. The best slide mounts for projection are

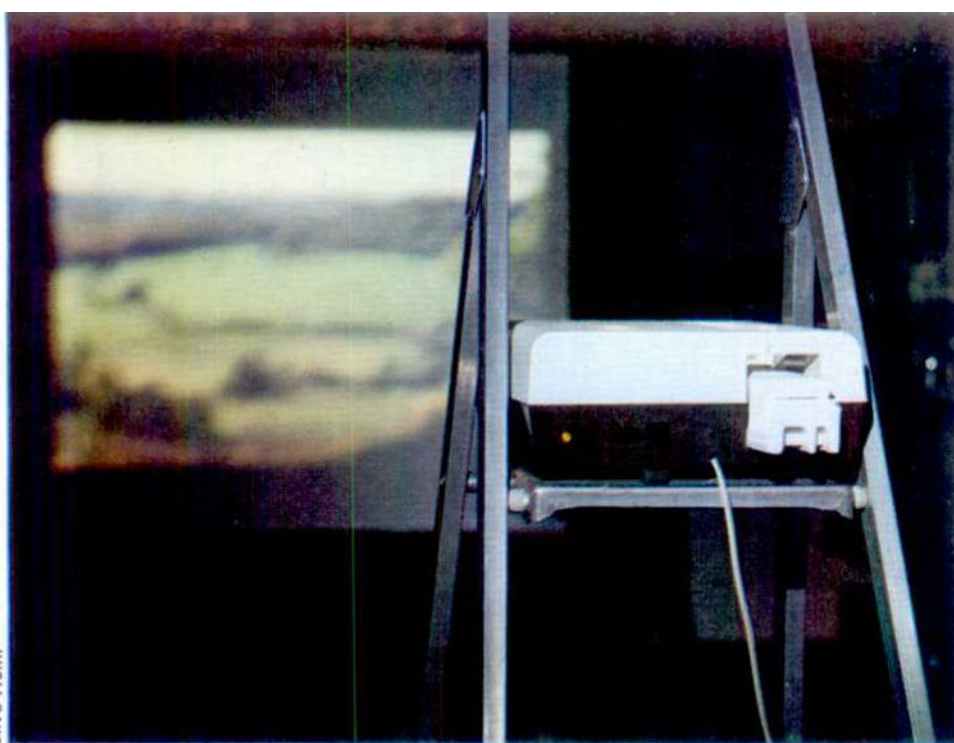
advisable, however, because a more powerful lamp automatically produces more heat as well as more light, and the extra heat may be sufficient to damage your slides and the optical system of your projector. There is also a risk of overloading the projector's electrical circuitry. Check the projector instruction manual very carefully before attempting to use any lamp other than the one supplied with the machine.

The best screen

The right screen is as important as a properly darkened room and powerful projector. The nature of the screen determines the sharpness of the image, its brightness, and even the angle at which the image can be seen.

Often the simplest screen is the best. A plain matt white wall or a large sheet of uncrumpled stiff white paper gives the sharpest possible image, and the image





the thin plastic and glass type. These work reliably with most automatic slide changing mechanisms and help to protect the slide emulsion from dirt and fingerprints. In addition, they stop slides from 'popping' out of focus as they warm up and expand in the projector gate. Slide popping can be annoying, even though automatic focusing devices in many projectors quickly restore correct focus.

If your projector has a manual slide changing mechanism, in which slides are fed through the projector gate one at a time, holding each slide briefly in the current of air blown out of the ventilation slots before you load it into the gate can reduce the tendency to pop. Some sophisticated magazine loading projectors include mechanisms that pre-warm slides by similar means.

Make sure that all the slides you are intending to show are correctly aligned so that you do not need to check the orientation every time you feed in a slide. The best way of doing this is to put a small spot in the bottom left-hand corner of the slide mount, with the slide

Stepladder stand *Piles of books make an unsteady support for a projector. A better solution is to use a stepladder*

held so that the emulsion side is facing away from you. Slides should then be fed into the projector so that the spot is in the top right corner—that is, upside down with the emulsion side facing towards the screen. You can make spots on slide mounts with a marker pen or buy suitable sticky paper spots from a stationer.

Marking your slides prevents the embarrassment of showing them upside down; standardizing, if possible, on one type of slide mount reduces the necessity for refocusing to a minimum. If your slide projector has manual focusing, you should stand by it throughout the show so that you can make minor adjustments whenever necessary. If your projector has remote controlled focusing and slide changing it is better to sit as near to the screen as possible so that you can monitor focus accurately.

A minor distraction that may prove difficult to eliminate is projector noise.

The occasional mechanical rattling that occurs whenever a slide is changed is brief and not usually objectionable, but the constant whirring of the projector cooling fan may be more obtrusive. Manufacturers try to make their projectors as quiet as possible, but if the noise bothers you or your audience you may be able to reduce it. If your home has a serving hatch between your kitchen and dining room, you can place the projector in one room and the screen in the other. A remote control handset can then allow you to join your audience and still work the projector.

There are a few other useful tips which can help a slide show run smoothly: remember to keep a spare projector bulb and a spare fuse somewhere in the house and make sure you know how to change bulbs quickly. A burnt out projector bulb can ruin an evening.

If all your slides are horizontal or vertical, their presentation can be improved by masking the edges of the projected image with black fabric on the screen. Without the dimly lit white screen visible around the image, colours look brighter and richer.

Showing the same slide for more than about half a minute can be boring and may lead to damage from overheating. Slides should not be left to cook in the projector gate.

Planning a show

Home slide shows are proverbially tedious. This need not be so. The main cause of audience boredom is over-enthusiasm on the part of the photographer; many photographers cannot resist the temptation to show every one of their holiday slides, or every picture taken of the family in the past decade.

The primary rule for avoiding this type of error is to be ruthless with yourself, your pictures, and to an extent, your audience. Evaluate your work very critically. A picture may have great personal importance for you, and yet be completely without interest to anyone else. Even your best friends are likely to find a long series of pictures of your

Back projection

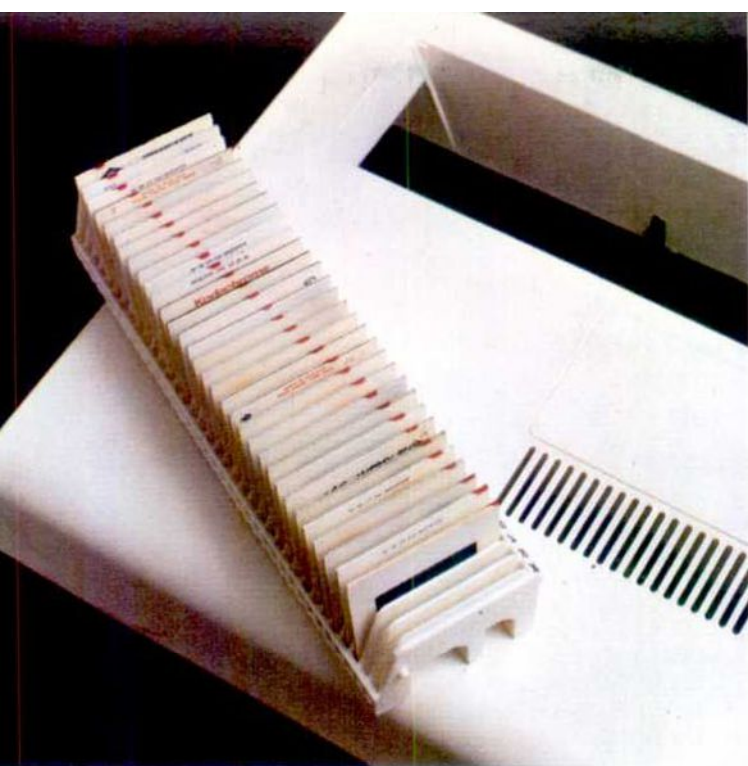
Back projection systems use a translucent screen instead of the usual reflective type. The image is projected onto the screen from behind, so that it is seen through the screen by transmission. To compensate for the lateral reversal of the image, the slides are oriented with their emulsion side facing away from the projection screen.

The main advantage of this system is that slides can be viewed in a normally lit room. For this reason back projection is popular with commercial and industrial users of slides, and many portable systems are sold. These often incorporate mirrors so that the projector beam is folded to give a compact screen and projector unit. The main disadvantage of back projection is that the screens are usually small, typically about the same

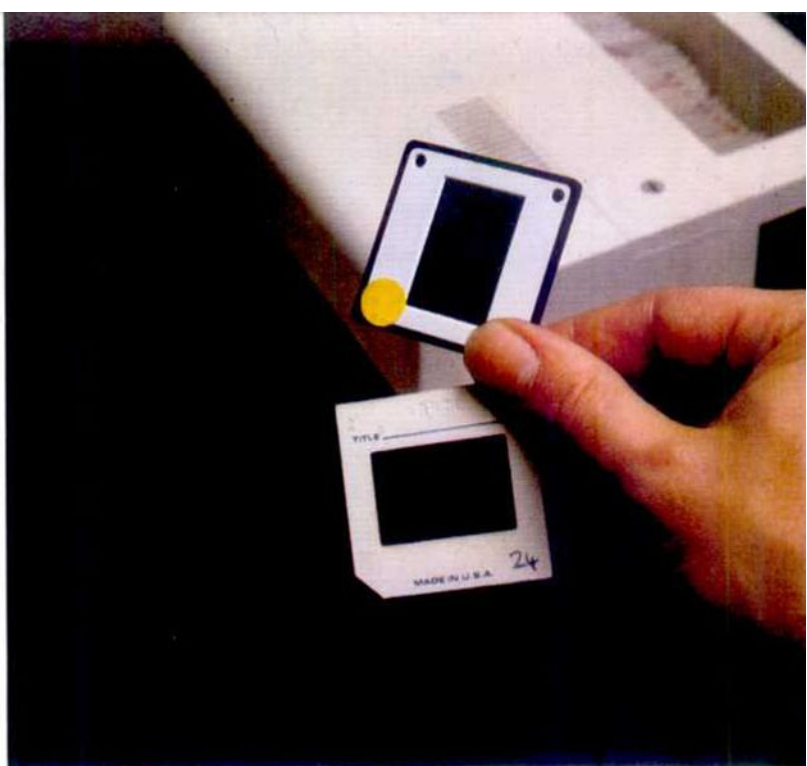
size as that of a portable television, and the ideal viewing angle is narrow.

Setting up your own back projection system can be difficult, but it is useful for previewing slides and planning shows. The only item of special equipment that is needed is the screen. Commercial screens are usually made of plastic or glass, but tracing paper held in a suitable frame can also be used. Ground glass can also be used provided that the glass is only textured on the side facing the projector. A minor problem is that the image tends to be brighter at the centre than at the edges. This 'hot-spotting' can be remedied by partially obscuring the projector beam with a disc stuck to a sheet of glass; the size and distance from the projector of the disc can be found by experiment.





In sequence By marking the edges of slides in a magazine you can quickly check that they are in the right order



Corner spotting Correct positioning is made easier by marking a corner of each slide, or snipping it off

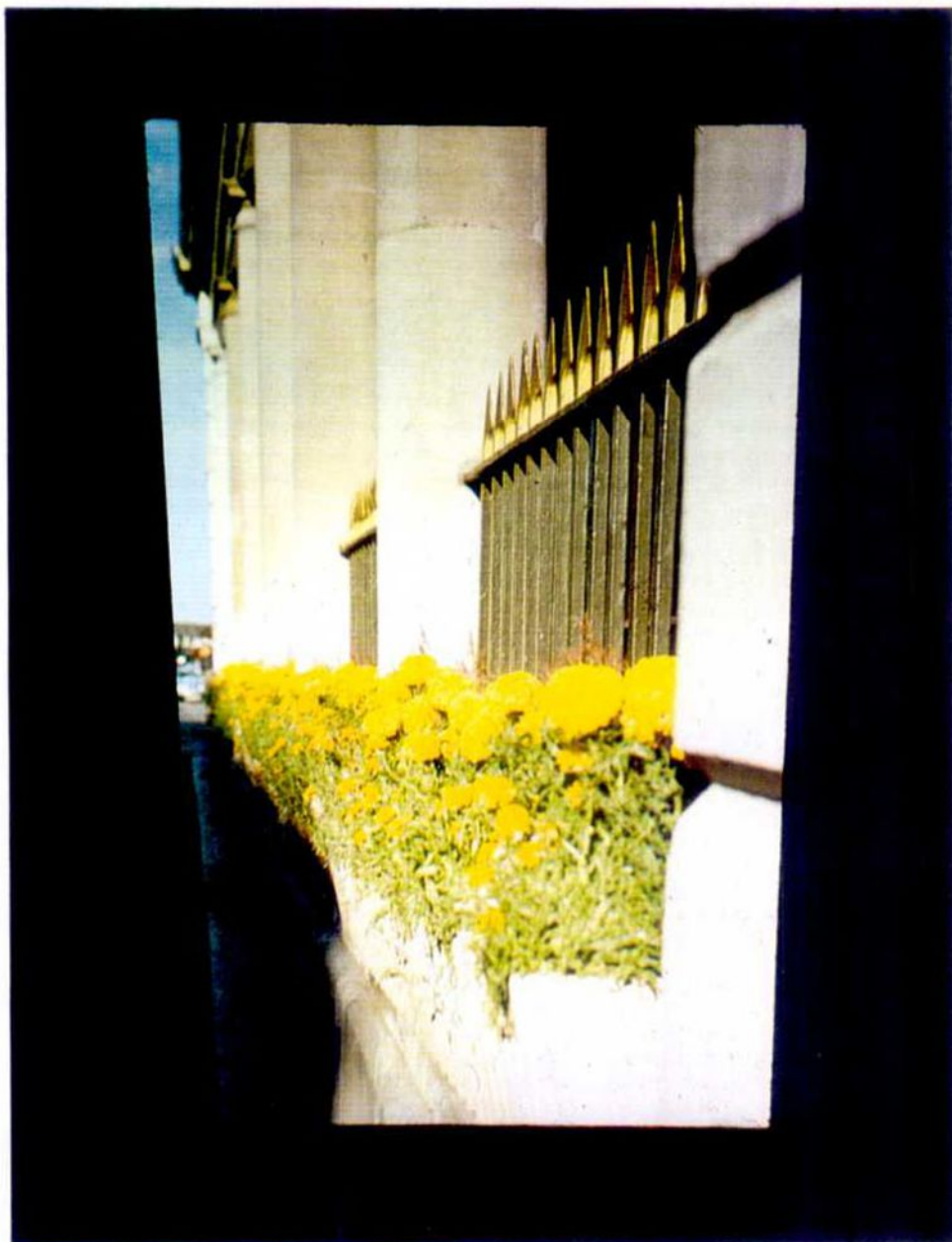
immediate family wearying.

Check your slides for technical errors such as poor focusing, camera shake, incorrect exposure, or bad framing. Consider what you intend to say about each slide as it is shown. If you anticipate having to make excuses about any picture, then you should not show it.

Ideally, your slide show should have some coherent theme linking each picture. This is not always possible, and it can be overdone, but generally the interest of your audience in what you are showing is preserved if each slide builds on those that have been shown before and leads in a clear direction. For example, holiday pictures are much more bearable if the sequence of slides follows the rough chronological order of the holiday itself, if only the most interesting highlights of the holiday are shown, and if the pacing of the pictures makes it clear that there is an end in sight. Suddenly introducing 30 shots of a remarkably picturesque church you have found is likely to seriously discomfort your audience, but such a sequence might very well make an interesting slide show in its own right. It helps to make notes before you start, so that you can be sure of making any necessary comments and of sticking to the point instead of drifting off at a completely irrelevant tangent.

Finally, your slide show should leave your audience hungry for more. For this reason your show should be too short rather than too long; about 50 slides is plenty for one evening. Your audience may try to persuade you to show more pictures; resist the temptation. Friends who have not seen quite enough of your pictures can always be lured back.

Distorted picture The projector should be level with the centre of the screen. Tilting it upwards causes 'keystoning'



Systems SLRs

Choosing a full system SLR means that you can easily add new pieces of equipment to your camera outfit as your needs change or develop

When photographers talk about cameras, more often than not discussion revolves around one particular type—the 35 mm single lens reflex, or SLR. The main reason for the popularity of the SLR lies in its great versatility. Most SLRs can be fitted with accessories of some kind, or at least have provision for interchangeable features, such as the lens. But a glance at a few manufacturers' catalogues shows that some SLRs are provided with a greater range of accessories than others. These are the system SLRs. Unfortunately, for the camera buyer, this can lead to problems—picking out the right system to suit your type of photography can be extremely difficult. The sheer volume of equipment available is bewildering. So, what are the advantages of an SLR system and how do you go about choosing one?

Choosing a system SLR

While all cameras are to some extent 'systemized' a true SLR system includes facilities for such accessories as motor drive, remote control, special flash units, changeable focusing screens and medical and research attachments. Some manufacturers, Nikon for example, try to produce as complete a system as possible while others produce accessories limited to particular fields of photography.

The problem of choosing lies in picking out a camera system which best suits your individual and overall needs of the moment as well as those which may arise in the future. This may involve choosing a cheaper camera and buying more system components than, say, a more expensive system containing fewer components.

One of the great advantages to the amateur of a system SLR is that you can begin by purchasing a body and, say, a zoom, or wide angle lens, and a motor drive, and then gradually add to your system as your photography develops. A well chosen system SLR should enable you to cover in the best possible way the precise areas of photography that interest you most and yet be flexible enough to be adapted to other areas equally well without leaving you dissatisfied or feeling that you have to change systems to get the results you want.

System flexibility and price are generally related. At the lower end of the market are those cameras for which only a few lenses and other items are made. If you wish to use such cameras

for specialized purposes, you have to use accessories made by independent manufacturers, an approach that may lead to unsatisfactory compromises.

In the middle price range there is usually greater flexibility. Provision for adding a motor wind, dedicated electronic flash and other items are often included. Such middle range SLRs are generally made by the larger camera manufacturers and may be used with some of the accessories made by the same manufacturer and intended primarily for use with an advanced, top-of-the-line model.

The most expensive cameras are sometimes called full system SLRs. The type was originated by the now-discontinued Exakta, which long had a reputation as being the doctor's camera. This was because it had a range of interchangeable viewing screens and prisms, special close-up and photomicrography accessories, and a host of other items which medical researchers tend to need.

Modern full system SLRs continue the Exakta tradition. Cameras such as the Nikon F3, Canon F1, Pentax LX, Olympus OM-2 and others feature a range of accessories enabling the photographer to tackle virtually any task. With care, it is possible to put together virtually a tailor made camera—Pentax, for example, even make a hand grip that the owner can carve to fit his or her own fingers. On a more practical level, being

able to choose a different viewing system may make a considerable difference to your photography. For example, Nikon owners with imperfect vision and a taste for wide angle lenses would find a type P focusing screen invaluable, since it incorporates not only split image and microprism focusing aids, but also cross hairs for aligning horizontal and vertical lines in the subject. Similarly, Canon owners who often take low level shots could standardize on Canon's adjustable sports finder, which allows either waist level or eye level viewing and exposure metering.

A full system SLR can usually be recognized by the degree to which it can be dismantled without tools. Removable backs, prisms, focusing screens,



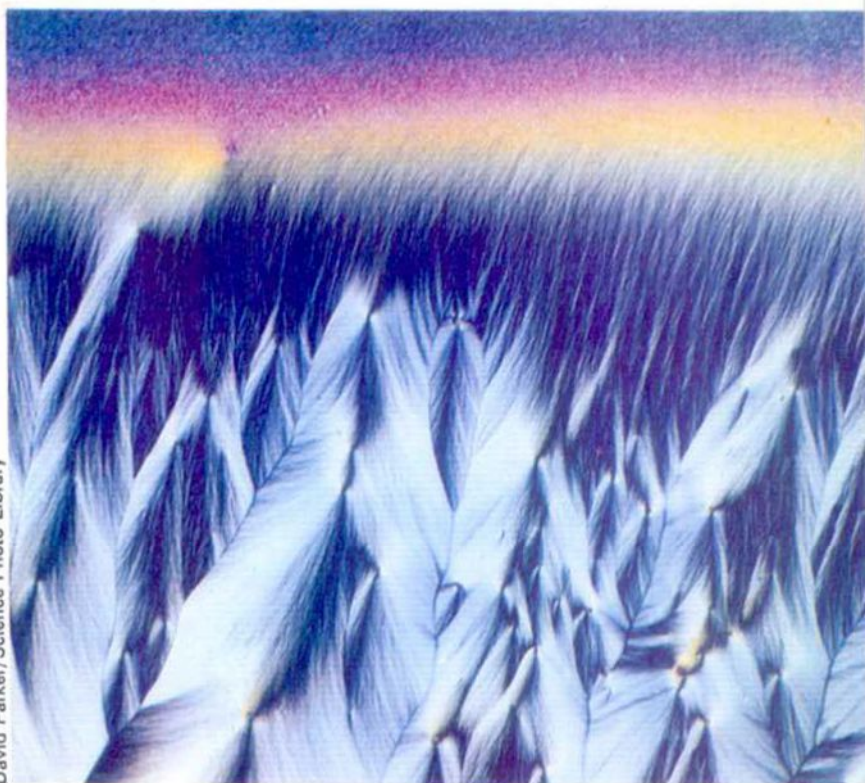
courtesy of Olympus



Dave King/equipment courtesy of Nikon



David Parker/Science Photo Library



SLR systems Olympus, Nikon and Canon produce the most extensive SLR systems. Olympus, shown here, have a complete range of lenses, alternative viewfinders and focusing screens and medical and astronomical attachments

Nikon's system includes bulk backs (below left) which can hold films of 250 or 750 exposures. The company also has a worldwide reputation for the versatility and robustness of their motor drive units (below)

ports for fitting motor winds and sockets into which electronic accessories can be plugged are the distinguishing marks of a full system SLR. But what can be fitted to the camera varies from manufacturer to manufacturer.

System possibilities

Most of the accessories made for system SLRs are designed for professional users working in industrial or applied photography. This partially explains the high prices charged for advanced SLR system

Absorbic acid magnified The Olympus system offers the greatest range of photomicrographic accessories

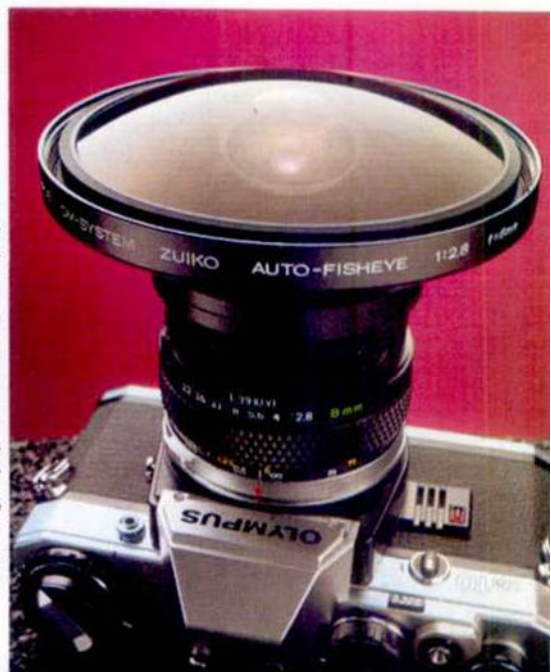
equipment. The market for specialized professional equipment is nowhere near as large as that for more basic amateur cameras, and production runs are therefore much lower.

In one sense, the knowledge that some of their cameras are likely to be chosen by professional users encourages manufacturers to produce items of equipment that can also be used by owners of amateur cameras. Most lenses from Olympus's range can be fitted to the amateur OM-10 camera, just as all Canon lenses can be fitted to the Canon AV-1, yet it is unlikely that Olympus would

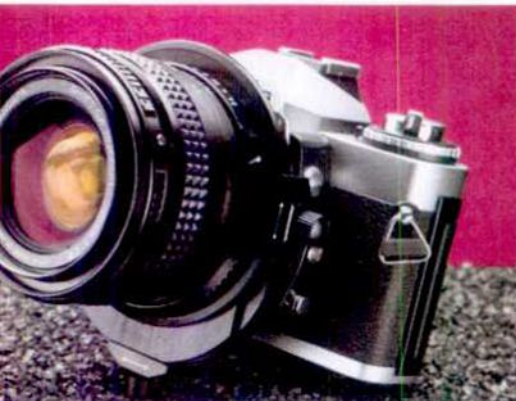
Fisheye lenses and other system accessories can be fitted to the amateur's Olympus OM-10



Dave King/equipment courtesy of Nikon



Dave King/equipment courtesy of Olympus



Shift lenses The problem of converging verticals can be eliminated with this f/2.8 from the Minolta system

have produced their 8 mm f/2.8 fisheye lens, or Canon their 35 mm f/2.8 perspective control lens, if they only sold lenses to amateur photographers. So another sign of a system SLR is that its manufacturer also produces a wide range of lenses, some with very specialized purposes. While it is not essential to own a system SLR to make use of these lenses, in some cases it is a considerable help. For example, both extreme wide angle and extreme telephoto lenses are easier to use if you can fit a specialized focusing screen to your camera.

Two fields of photography that are more or less dominated by full system SLRs are those that involve photography by remote control, and those that involve photographing small subjects at high magnifications. Remote control photography includes specialized applications for such things as time lapse and surveillance photography.

The increasing popularity of simple

motor winders among amateur photographers has led some manufacturers to produce non-system SLRs with remote control facilities. Often these sell at a lower price than the full system SLRs. For example, a non-system Chinon CE-4 with lens, motor winder and built in intervalometer (auto shutter release) costs less than the Nikon intervalometer alone. One reason for opting for the Nikon system rather than for a Chinon would be to take advantage of other items in the system, such as a 750 exposure bulk film back or some specialized lens not available in the Pentax K-fitting used by Chinon.

Applications involving the use of high framing rates, interconnection of several cameras, special data recording other

On the record Data backs are useful for recording the growth of your family or even the plants in your garden. Here, the date and time are shown



Steve Mansfield



than a simple record of the time or date, remote control by radio or infrared and other functions virtually demand a system SLR. The range of such applications is broad and has led to specialization even within system SLRs. For example, although Nikon generally offer the broadest range of motor drive related accessories, along with the fastest motor drives in standard production, their products do not cover



Dave King/equipment courtesy of Olympus





Dave King/equipment courtesy of Olympus

Olympus made microscopes before they began to produce the OM series of SLRs, and their SLR system reflects their expertise in this field. In addition to the usual system SLR close-up accessories, such as bellows and extension tubes, Olympus also make special purpose light sources, short focus high magnification bellows lenses, and sophisticated microscope adaptors.

Because of their wide acceptance among professional photographers, some system SLRs (notably Canon and Nikon) are given extra support by manufacturers and camera repairers. Both Canon and Nikon have been known to organize special repair facilities for their cameras at large public events such as the Olympics. And because of their wide international usage, it is generally easy to have an F series Nikon or Canon repaired anywhere in the world should a fault develop. Another reason why it is easier to get full system SLRs repaired is because they generally remain in production much longer than SLRs designed for the amateur market. Full system SLRs made by Nikon, Canon and Olympus have average production on runs of about ten years, whereas amateur cameras may undergo major redesign every year or two. Camera

repairers have plenty of time to get used to the peculiarities of full system SLRs.

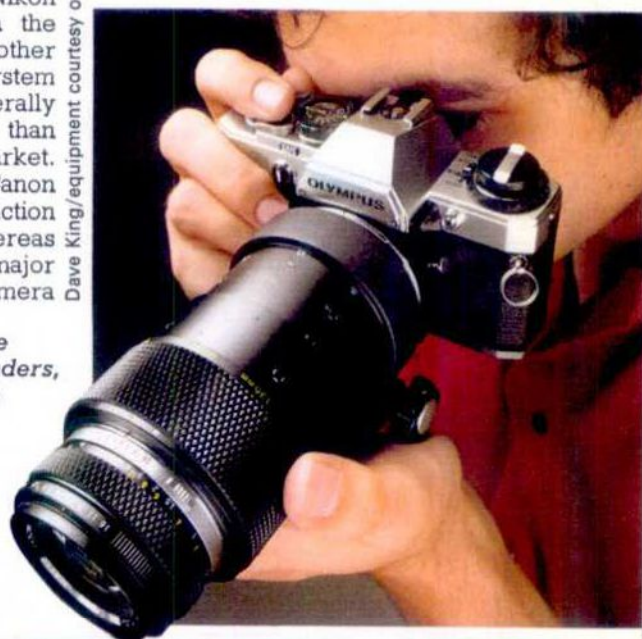
Some independent manufacturers produce specialized accessories to meet needs not covered by the manufacturers of full system SLRs. The underwater housings and accessories made by firms such as Ikelite are an example. These devices are mostly produced for Nikon, Canon and Olympus system cameras. In the case of such specialized items, the fact that they are produced by independent makers is not necessarily a disadvantage. Firms that concentrate on producing accessories for one special field such as underwater photography can concentrate on meeting the needs of underwater photographers more closely than camera makers with diverse product lines.

every possibility in this field. Bulk production of audio visual presentations calls for extremely high accuracy of frame-to-frame registration, a need that is met by a special model camera made by Alpa, a relatively small manufacturer. System SLRs cannot do everything—they simply make it easier to achieve a wide range of purposes.

Close-up photography is another field in which one manufacturer is the leader.

The Pentax system includes a large range of eye- and waistlevel viewfinders, including one which rotates through 360° for use in either position.

Olympus's telescopic autotube functions as a portable bellows for 'action macrophotography'. Canon produce the fastest 300 mm lens—the f/2.8. Though bulky, its speed gives it the edge over the Olympus f/4.5

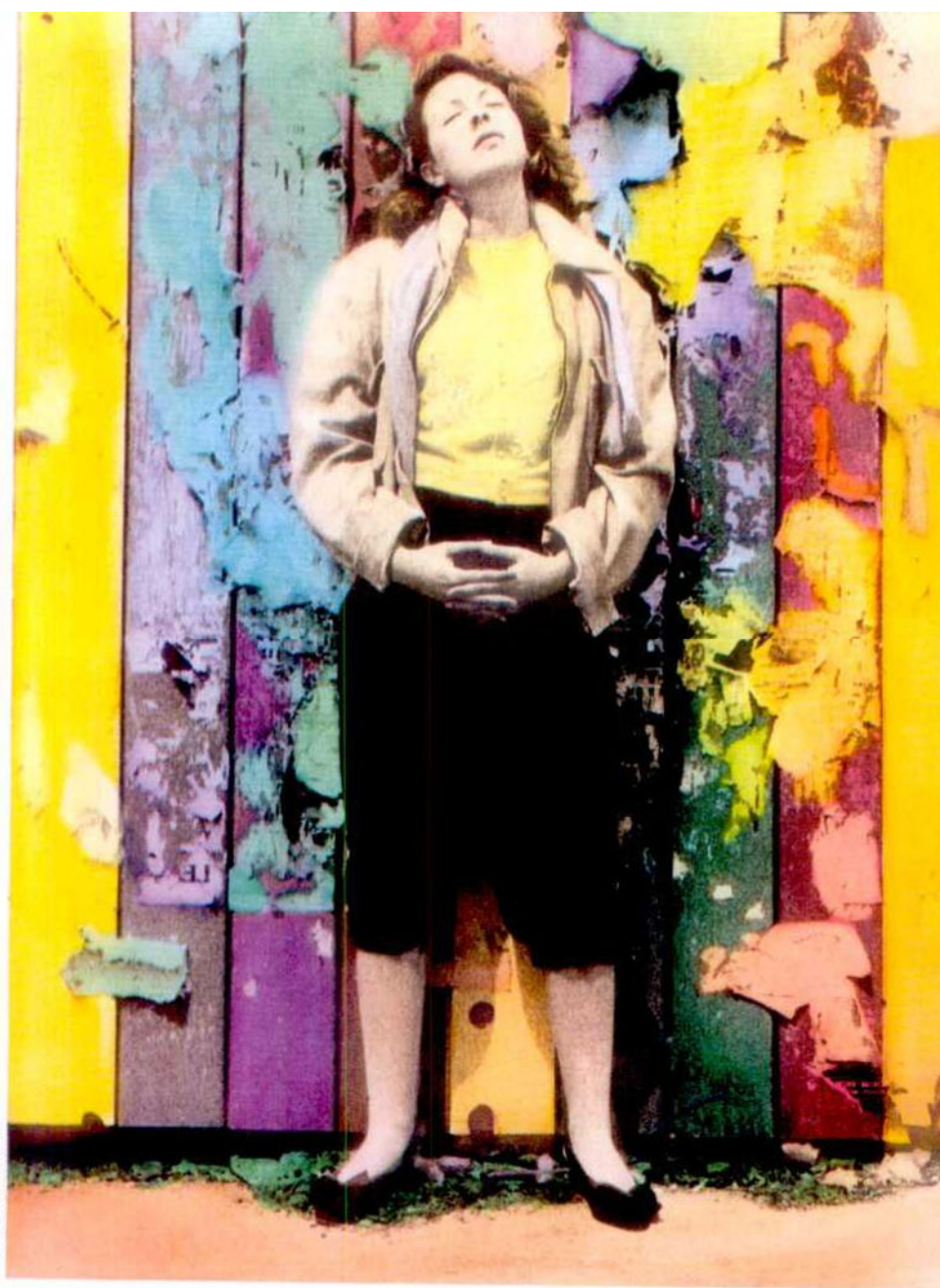


Dave King/equipment courtesy of Olympus

Which system ?

Your choice of 35 mm SLR system will depend upon the subjects that you want to photograph. This chart may help you make your selection

Subject	Accessories required	Systems manufacturers
Architecture	Shift lenses Ultra-wide angle lenses Data backs	Canon, Nikon, Olympus, Minolta, Pentax Nikon, Pentax, Olympus, Canon Olympus, Canon, Pentax, Nikon
Medical	Special lenses Ring flash Microscopic and endoscopic attachments	Nikon, Olympus Olympus, Nikon Olympus (extensive range), Minolta
Close-up work	Extension tubes Bellows	Olympus, Minolta, Nikon Nikon, Olympus, Minolta
Action shots	Motor drives Zoom lenses Fast lenses Follow focus lenses Interchangeable viewfinders	Nikon, Pentax, Canon, Olympus Canon, Minolta, Pentax Canon Leica Pentax, Canon, Nikon
Wildlife	Long lenses Remote control	Canon, Leica, Nikon, Pentax Olympus, Nikon, Canon, Leica
Repro copying	Copy stands	Nikon, Olympus, Minolta, Canon, Leica



Girl and fence *A deliberate choice of strident colours breaks the mood of introspection suggested by the pose*

your camera while you take a picture of your reflection. You can add interest to this sort of picture by the clothes you are wearing and by taking care to include objects or a background which complement the self portrait. In taking a picture of your reflection, you should be careful with focusing, because the reflection actually appears as far behind the mirror as you are in front of it. You must focus on the reflection, not the mirror itself. And you cannot use flash for such a picture, as the flash will create so much glare that you will be almost invisible.

Using a mirror to make a self portrait is actually very helpful, as you are then able to practise expressions and poses before releasing the shutter. If you want

Creative approach

Self portraits

When searching for subjects for portraits, why not look behind the camera? Self portraits give plenty of scope for the imagination and can be very revealing

There are many reasons why you may want to take a picture of yourself. You may need a portrait for a formal occasion, or a passport, for instance, or you may want to put a figure into a setting when you have no model available. But probably the greatest motive for making a self portrait is that it is an ultimate form of self-expression.

Every photograph you take reveals something about yourself by your choice of subject and the way in which you interpret it. However, in taking a self portrait you have the advantage that you are both photographer and subject, thereby being in complete control of the

final image. As such, self portraiture represents one of the most challenging of all photographic themes, and one of the most gratifying. You will find, in making a self portrait, that you will not only learn more about lighting, posing, composition and focusing, but you will also learn quite a bit about yourself. Many photographers, as well as classical artists, have taken self portraits, and their efforts have a much more personal quality than any portrait made by another person.

There are many ways to take a self portrait, the easiest of them being merely to stand in front of a mirror with

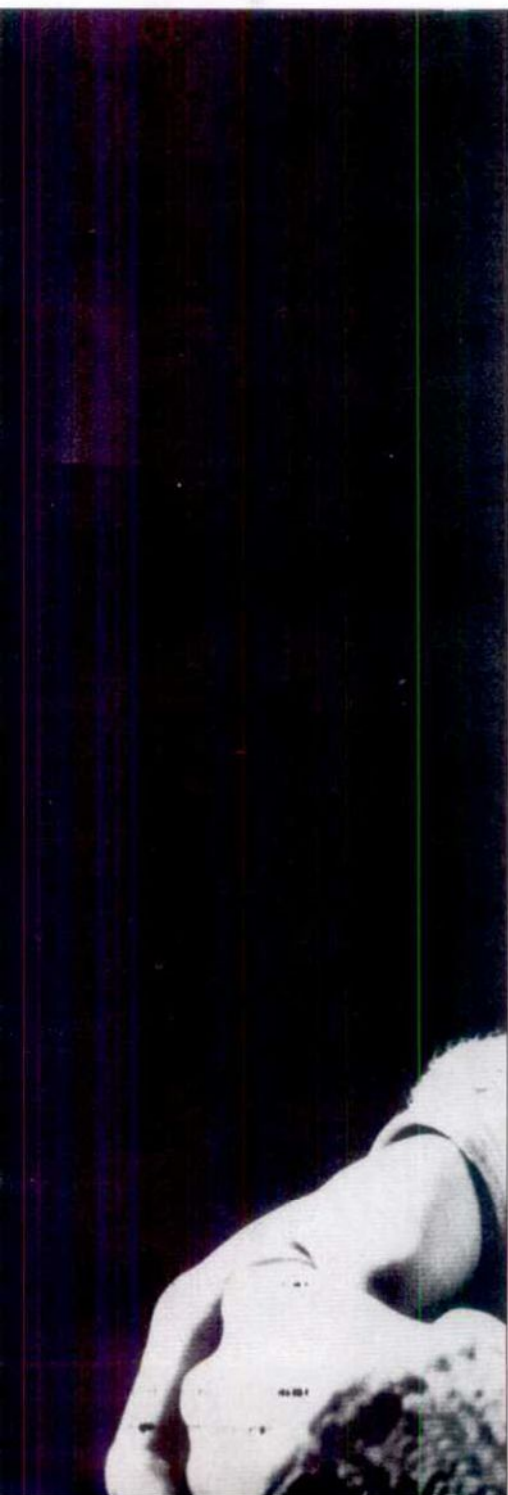


Linda Benedict-Jones

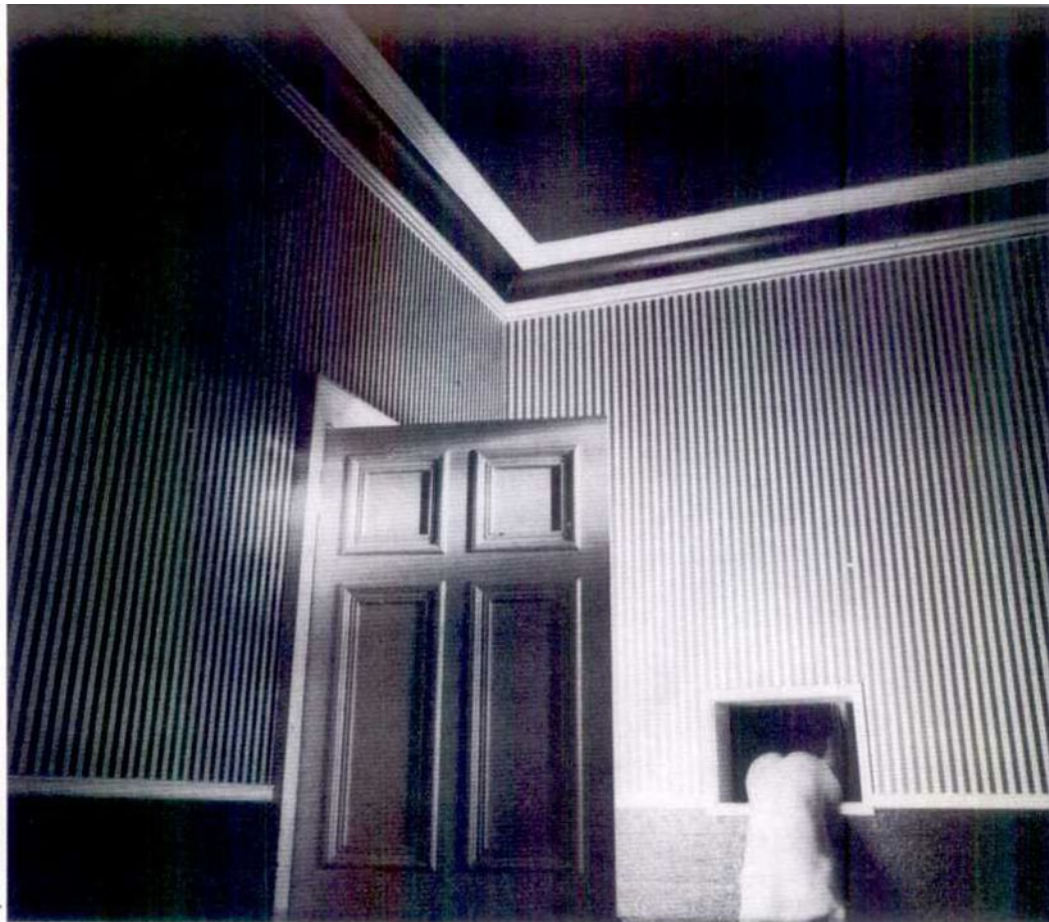
to use a mirror but do not want the camera in the picture, you should mount the camera on a tripod a short distance to one side of you, angled in such a way so as to have only your reflection in the final image, but sufficiently close that you can still operate it. For focusing and composition, either measure very carefully before you take your position, or else use a target prop which you then replace with yourself.

There are many different ways to release the shutter in making a self-portrait. You can, if you are close enough, simply reach over to where the camera is mounted on a tripod and release the shutter by hand. You can also use the self-timer available on many cameras, which gives you several seconds be-

Hands before mirror Careful framing to show only a part of the face and body, provokes the viewer's curiosity



Syd Mannon



tween releasing the shutter and taking your place as the subject. Alternatively, there are extra-long shutter release cables available, working on the air bulb principle. For pictures taken over a greater distance the most convenient method is to use an electronic remote control, operated from a small handset.

If you use such methods to operate the shutter, you can place the camera some distance away, pointing directly at you without using the mirror to reflect the image. But it is useful to have a mirror close to the camera so that you can check your pose and the lighting before taking the picture.

Unless you use a mirror you will often need to create the picture completely in your mind before you begin. You will have to imagine the pose and expression you are going to adopt, and what effect you would like to finally achieve or what statement about yourself you would like to make.

As in all good pictures, a self portrait, to be effective, should convey a strong feeling or idea. You should strive to express a certain mood or emotion in your picture. You are, in fact, interpreting yourself, so include your personality, your physique, your tastes, and your photographic style into the picture. It can be useful to select a background and poses that will convey something particular about your individuality.

A casual and interpretive self portrait can be made by placing yourself in an environment that expresses something about yourself—perhaps in front of your home, in a favourite room, or outside, such as in a park or in a landscape. The objective is to try and say as much as you can by selecting either poses or backgrounds that will help you do this.

Open door The stark geometry of the room is contrasted with the human form. **Edward Steichen** The framing suggests a shy, tentative regard for the camera

Edward Steichen/Galerie Badoin Lebon





Wing mirror An apparently casual self portrait, but in fact a carefully considered study which evokes a particular mood

Props can also be used. You can photograph yourself by a window, reading a book, or with a musical instrument, or lounging in your favourite chair. You can, similarly, pose with your car or your pet.

Many photographers take self portraits of themselves with their cameras, signifying that photography is important to them or that they identify with it in some way. You can do this directly, by aiming the camera straight into the mirror or by mounting the camera on a tripod and standing beside it. Or you could be more inventive, and take a picture of yourself, for example, holding a lens to your eye, thereby conveying the 'I am a camera' idea.

Conceptual self portraits, which reveal a particular emotion or physical state, can be among the most challenging and interesting. You can convey loneliness, for example, by posing on an empty road, or in a vast landscape where there is little in the image but yourself, or near an abandoned building, or in a room empty of everything but yourself. If you wanted to make the statement that taking a self portrait is a self revelation, you could make the most of this approach by taking a picture of yourself as a nude, portraying an 'I totally reveal myself' idea. There are as many different concepts as there are people.

You might want to take a picture of yourself engaged in some sort of activity. For action self portraits, using a self timer, it is helpful to use a great depth of field, so that you can be sure that you are in focus within a wide range. In addition, it would help to use a wide angle lens, relying on your ability to crop later, thus ensuring that all of yourself will be in the picture without the need to move too far from the camera. This way, you can photograph yourself running, doing gymnastics, or swinging

a tennis racket or a golf club. Many a lone sailor has recorded a solo voyage by taking a self portrait at sea, in this case a necessity since no one else is around to release the shutter.

An entertaining source of self portraits is to photograph your reflection in a store-front window. In this way, you record not only the reflection of yourself but also whatever is being displayed in the shop. In addition, you will record the activity in the street behind you.

Reflections that occur on water can also be used to make an interesting environmental self portrait. You can photograph your image in a puddle or

After lunch Even the fine detail in this picture does not attempt to conceal the cable release, which reveals it as a clever self portrait





André Kertész



in a pond. By using water, you can either avoid ripples, or use them for an unusual effect.

There are a variety of reflective surfaces out of doors, including the chrome on cars, door knobs, or even brass instruments.

Although at first the idea may seem very simple, using your shadow is one way of making an interesting and challenging self portrait. You can take a picture of your shadow on a road, against a building, or with a prop such as a bicycle or oddly shaped item that might add graphic or symbolic interest to the picture. Many possibilities exist in taking a picture of your shadow, as the time of day dramatically affects its size and shape, and you can choose the background and the time of day to add to the interpretation.

Self portraiture lends itself to such special effects techniques as double exposures, multiple images, sandwiches and montages. You can make all manner of interesting photographs using special effects techniques, following all the possibilities that are available with subject matter other than yourself. You can make an image where you appear to be inside a box, or in an unlikely location. You can use colour in a purely graphic way, with filters, and the like, making multiple exposures of your silhouette. This approach is especially relevant if special techniques are a part of your photographic style. Another approach might be to photograph yourself with smoke from a cigarette or a cigar filling the frame with soft blue

whirls, to create mood.

The lighting that you use in making a self portrait is important. If you are photographing indoors, the lighting is the same as that used for making any studio portrait, with side- or overhead bounced light being generally the most flattering. If you want an exaggeratedly dramatic picture of yourself, you can light your face from below, giving yourself a weird, eerie look.

Outdoor portraits are easier, as the brighter light means that you can stop the lens down for a greater depth of field, making focusing simpler. For harsh effects, use bright sunlight, which creates dark, sharp-edged shadows. They can make you look much older than you are, as they can make your face look as if it were hacked out of stone. For softer effects, a hazy sun, overcast weather or open shade will provide a diffuse light source that is the most flattering to human skin.

Remember that you do not have to take a frontal picture of yourself. You can photograph just a part of your body—your feet, your torso, your hands, an eye, or anything but your head. Isolate a part according to something you would possibly like to say, or just for the graphics or humour. You can, for instance, photograph your arms circling a tree, with your body hidden behind it, your legs sticking out from under a car, or your feet as through a fence. Other possibilities include photographing yourself from behind, perhaps sitting on a cliff overlooking an ocean, walking out of a door, or looking out of a window.

Multiple exposure Here imaginatively used by Cecil Beaton to express the many sides of his personality.

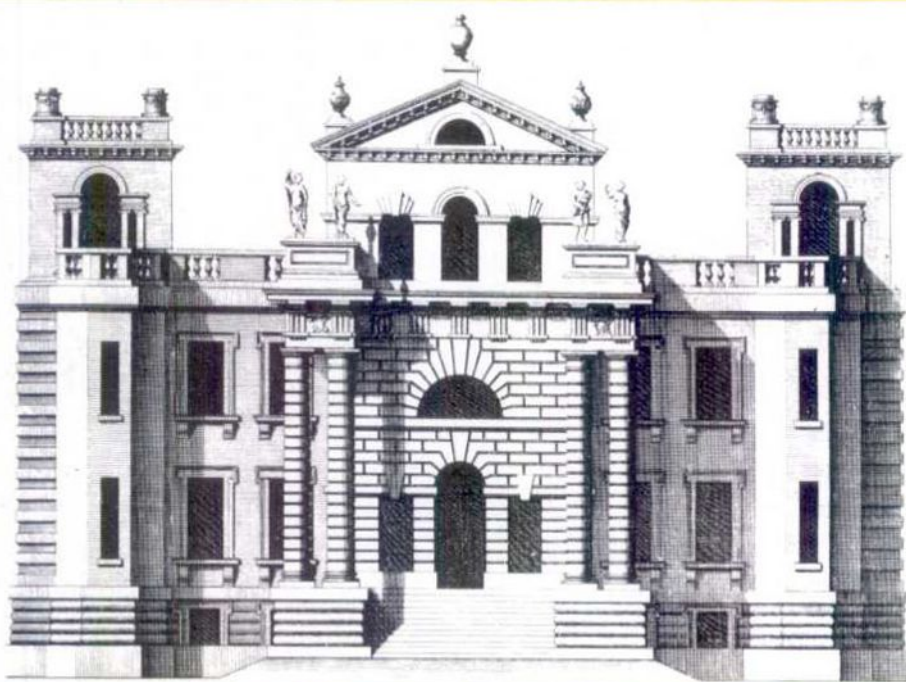
A shadow of himself by André Kertész. Shopping bag A deliberately unflattering exposé



Handsworth self portrait

Line and lith film

Normal b & w film records an image in various shades of grey, but high contrast line film and lith film give the pure black and white image needed for certain processes and effects



Mansell Collection

Contrast is an important feature of any photograph. It can greatly affect the impression of sharpness, and give impact to an otherwise average shot. Control of contrast is, therefore, an important element of picture making. So *line* and *lith* films—which are black and white materials giving extremely high contrast—are useful for pictorial purposes, as well as more specialized

technical applications.

These films are often used to make high contrast images from normal negatives or transparencies, or in a large format copy camera, and are principally designed for technical use. For these reasons, they are normally available in the form of sheet film, varying in size between 9 × 12 cm and 24 × 30 cm, though 35 mm lith film is available in 30 m rolls.

Line drawing This is the type of subject for which line film is ideal

Contrast range

The high contrast of these materials is clearly shown in their characteristic curves. A low contrast film gives a gentle slope, showing a gradual variation in density from shadows to highlights. A high contrast film, on the other hand, gives a very

steep curve, with an abrupt transition from low to high density. In addition, a high contrast film shows wide extremes of density, from clear emulsion to almost complete opacity, while low contrast films usually have a small density range.

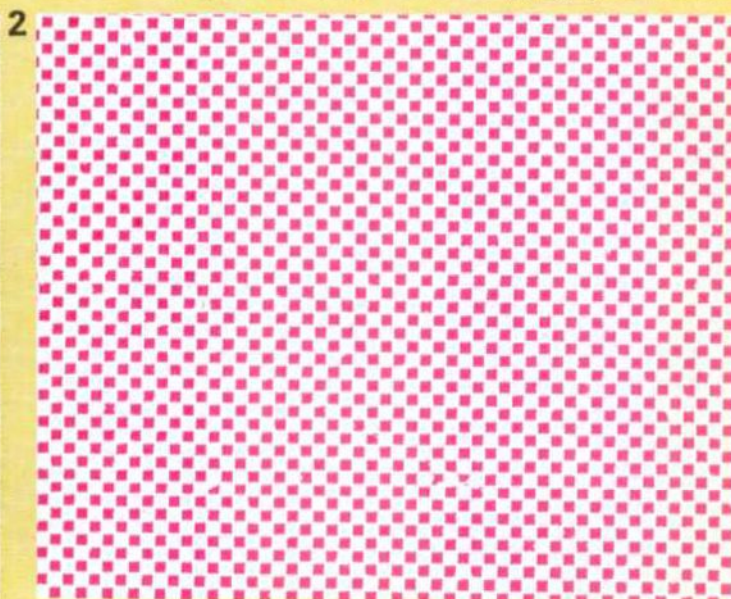
The properties of line film are due to its emulsion, in which the silver bromide crystals are small but very uniform in size. All other factors being the same, grains of equal size require the same amount of exposure to make them developable. When line film is exposed to a subject with a range of tones, only one of two things can happen. An area receives either sufficient exposure to make all the halide crystals developable, or too little for any of them to develop. Ideally, the result is that the area comes out either as solid black and white but results normally contain a little grey. A normal emulsion has crystals of varying size so that in an area representing a mid tone, some of the larger, faster grains will become sufficiently well exposed, while others—the smaller slower ones—will not. After development, such an area will be neither clear nor opaque.

Because of the smallness of the grain, line film is very slow. It is also usually either blue sensitive or orthochromatic (sensitive to blue and green), and so can be used with a safelight. As its name suggests, its chief use is for copying pen and ink



Steve Mansfield

Lith film in printing For reproduction in print, a b & w picture (1) is photographed on lith film through a dot



screen (2) coloured for use with special contrast filters. Because of the high contrast of lith film, tones in the

drawings, type matter and other originals for which the copies should have jet black lines on a snow white ground.

Lith films are very similar to line films, but give even higher contrast due to their very fine and even grain structure. Lith film is basically so slow that it is nearly always made orthochromatic, rather than just blue sensitive. This is so that its sensitivity to green light, as well as blue, prevents its speed being excessively slow. Even so, the speed of a typical ortho lith film is about 6 ASA (ISO) to tungsten light. It is difficult to give an exact film speed, as this depends so much on exposure and development conditions — and the required result.

There is at least one blue sensitive lith film available for circumstances in which slowness is no drawback. Its advantage is that it can be handled under brighter orange safelights, rather than the red lights required by ortho films.

Lith films are most commonly used in graphic reproduction processes to produce half-tone and colour separation negatives (see page 1128). For the latter, panchromatic film is available, but this has to be handled in total darkness if freedom from fog is to be guaranteed.

In practice

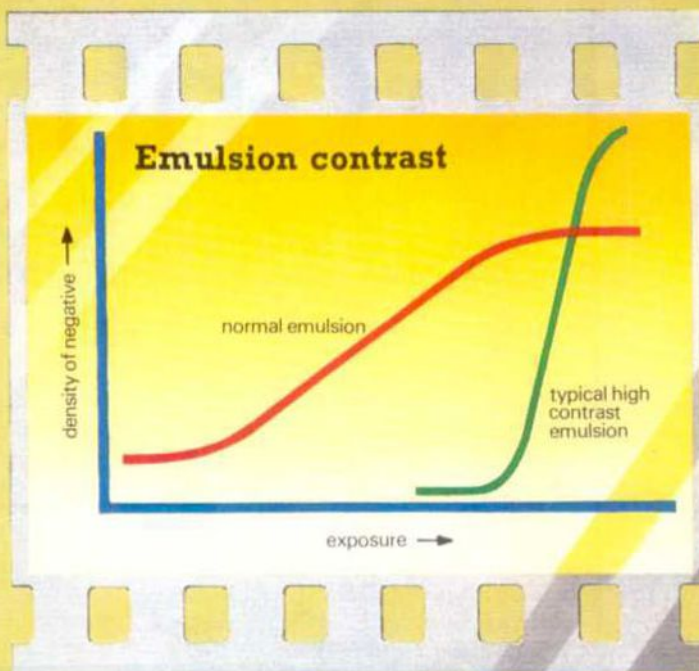
Exposures with line and lith films are usually determined by testing—by using test strips, for example—an exposure meter does not generally

give very reliable results, and because of the high contrast, exposure latitude is small.

Development is also fairly critical. Special developers are used to enhance the contrast—for line film these contain hydroquinone as the sole developing agent, and a powerful alkali such as caustic soda. An ordinary printing paper developer can be used if less than the maximum contrast is acceptable. In fact, by using a soft working developer it is possible to make tolerably good negatives of ordinary multi-toned subjects, especially if they are of low contrast. But as a rule, normal developers are only used when the requirement is for high contrast with a few remaining tones.

Similarly, a special developer is used with lith film. Like line film developer, it is a hydroquinone formulation, but it is so designed that it exploits what is called *infectious development* (see page 914).

In well exposed areas of the negative, those grains which have received sufficient exposure to be developable may be mixed with grains which are not quite sufficiently exposed (particularly at the edges of tones). Normally such an area would develop as a tone, rather than as complete black. But with infectious development, as development proceeds in the well exposed areas, accelerating compounds are released



Advertising Arts

which encourage development of the less exposed grains. The dark parts of the negative thus become virtually opaque whereas the unexposed areas remained unaffected.

One problem with infectious development—which in lith developers is caused by the inclusion of formaldehyde—is that it often leads to the blocking up of fine detail (such as fine black lines in the original) due to the spreading of the dark parts of the negative. For this reason, development with lith film is quite critical.

Another problem with developers for both line and lith films is that they are very active and are quickly exhausted by oxidation by

Characteristic curves showing how different light intensities are recorded by normal and high contrast emulsions

the air above the solutions. Their working lives, especially when used for dish development, are short, sometimes only a matter of minutes, although some proprietary lith developers remain usable (if not perfect) for a working day. Lith developers are normally stored as two stock solutions which, when separate, keep for some time. These are then mixed in equal proportions just prior to use. There are single solution caustic hydroquinone developers, but their storage lives tend to be short.



original are recorded in the resulting 'half-tone' negative (3) as solid dots of different sizes. Before



printing, this negative must be contact printed, again on lith film, to produce the half-tone positive (4)

Steve Mansfield



World of photography

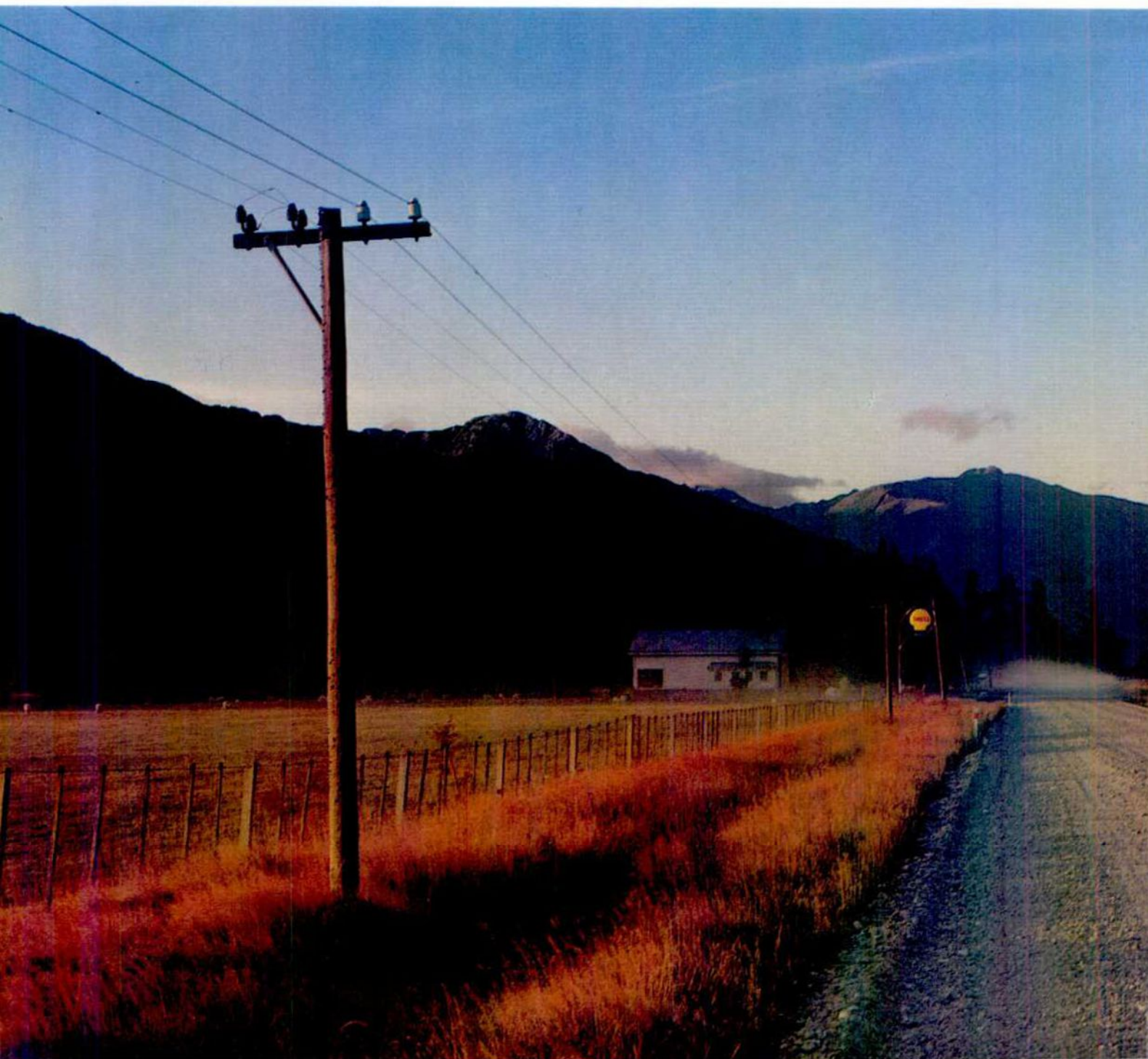
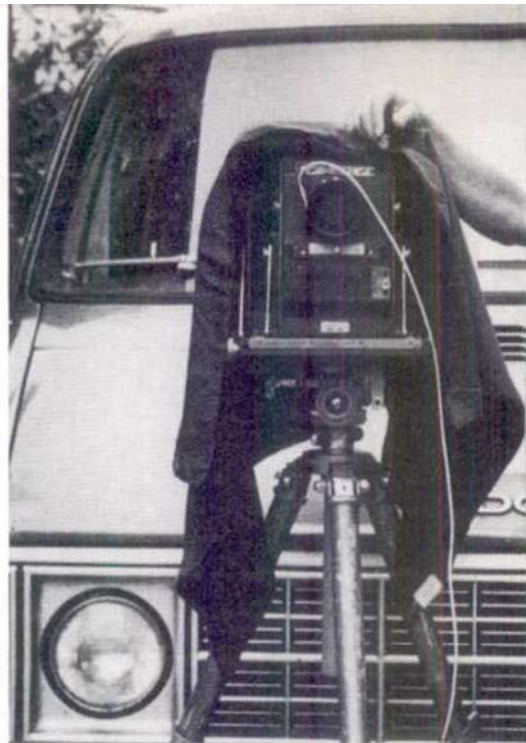
Ken Griffiths

Travelling with a camera that attracts a lot of attention can be a positive disadvantage, but Ken Griffiths has used it to create a unique personal style

Most photographers prefer to work quietly and unobtrusively when on location. Not Ken Griffiths. Wherever he sets up his Gandolfi stand camera, he immediately becomes the centre of attention, and every photosession seems to take on the air of a theatrical performance. People crowd round, fascinated by the massive hand-built wooden camera, and excited by the idea that this cumbersome apparatus, so unlike modern products, is actually going to be used to take a picture.

Ken would not want it any other way. Because his camera is so conspicuous, he could never sneak candid pictures of people and if they do not want to be photographed, they can always walk away. 'To me, that's important—I don't like imposing. People can say no and I leave them alone.'

In fact, people rarely do refuse and Ken often finds the excitement generated by the presence of his camera acts like a magnet. 'People start bending over backwards to help you because





The open road Late afternoon in Otago in the South Island of New Zealand. Taken for a photoessay on the country commissioned by the 'Sunday Times'

Peasant woman This stately woman was photographed in a small town in central Ecuador. Ken used a 150 mm lens and set the camera at f/16 for 1 second

they want to see what's going on.

Naturally, Ken has become rather attached to the camera that provokes all this enthusiasm. The Gandolfi is, of course, a beautifully made camera and Ken has three of them—all hand-built from mahogany, with brass fittings and leather bellows. 'Having a Gandolfi is like having a friend—a wooden camera feels more personal somehow.' He rather enjoys the sympathetic reaction it provokes. 'People laugh, feel sorry for you, want to help you . . . 'Poor chap, he can't afford anything else,' they think.'

Of course, Ken does not only use a

Gandolfi because it attracts so much attention: he also finds it a very workable camera, as it uses the large negatives—up to ten by eight inches—that he likes. Nevertheless, it is clear that a rapport with people is most important to his photographic style.

Like many professional photographers, Ken uses Polaroids to test composition and focus once he has set up the shot—black and white Polaroid rather than colour, because he feels colour is less reliable—but he values the Polaroids not only for the tests but because he can give them away.

'Polaroids are terrific. When you take a photograph of someone, they're doing you a favour—it's nice to be able to give them something in return on the spot. Polaroids also attract other people and they want to join in. This can lead to another picture. Polaroids are very important to me.'

Naturally, for a photographer who values this involvement with people,

location sessions are far more attractive to Ken than studio work. Indeed, unusually for a successful advertising photographer, Ken Griffiths does not have a studio at all. 'I started out with the idea that I did not want a studio and I never went out looking for studio work.' He was lucky in that once he had done a few successful location jobs independently, his career snowballed and people commissioned him to do the type of work he wanted to do.

'I think travelling is a big eye-opener. I don't like staying in one place for too long. I use the camera as an excuse to travel. One of the drives is to find out what makes other people tick. In fact, it takes about a week to organise a trip, and to get away. Now I know that I can leave the country very quickly if I need to. Of course you have to check out visas and what jabs to have. Every year I have all the jabs that I need, so I don't have to worry about that.'

Although Ken does not have his own studio, he seems to take an impressive array of equipment on location—his large Gandolfi cameras ensure that he can never move around lightly. When travelling around Europe, he takes a three tonne Dodge van filled with enough equipment to virtually build a studio on the spot.

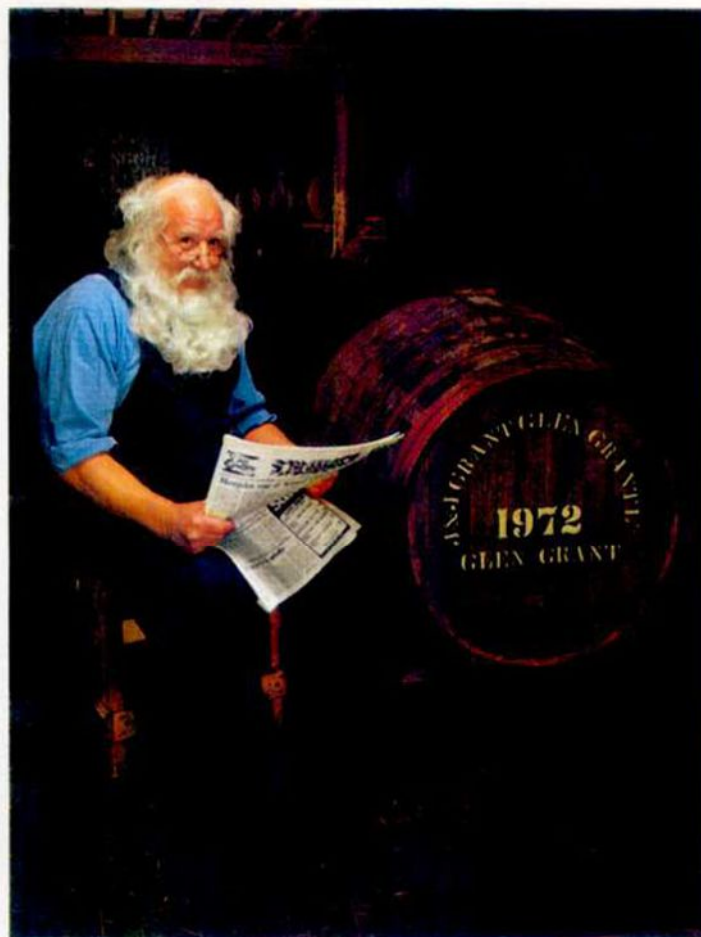
'I carry many studio lights—a Braun-color 6000 joule pack, two Linkron units of 4000 joules each, a boom, three or four different heads—poles to construct backdrops, a cover for me or reflectors, two or three different reflectors, along with lots of wires, leads, and metal foil. I can use the roof of my van as a platform if I need to. It's also high enough to look over hedges and things to get good views.'

Even for the long distance trips outside Europe he goes prepared with eight large cases of equipment. 'I have a tripod and a Gandolfi whole-plate camera which I mainly use with 5x4 film. I carry a 90 mm Super Angulon, 150 mm Schneider, 210 mm Schneider and a 480 Goertz lens with a Kodak shutter. I also take a couple of Gossen Lunar Six meters, a Minolta meter that gives flash readings and allows for mixing light sources, and a Minolta colour temperature meter. I've got about 60 double sheer film-holders—giving 120 photographs—and two boxes of filters. These include the Wratten 80, 81, 82, 85B series plus a whole range of greens, yellows, blues and reds—I use mostly tungsten balanced film and then convert for use with daylight and long exposures. I do a lot of shots where I'm mixing ambient light with flash, so colour correction and filtration can be quite complicated. I really prefer available light if I can get it, but I do carry a couple of Braun F910 flash packs for fill-in.' Ken is also unusual in that he can do his own camera repairs. He carries a lot of spare parts for his cameras and a tool kit so that he can deal with repairs on the spot. Of course, the range of equipment that he takes on assignments, depends upon



American graffiti Ken took a series of portraits of people with their cars, trucks and bikes for use in a new promotion for Kamasa, the specialist tool manufacturers. This is Dwight Scharli in Modesto, California

Country life The spectacular effect of light and shadow was caught in this shot of Ross in Westland, New Zealand while Ken was on assignment for the London 'Sunday Times.' Taken at $\frac{1}{2}$ second at f/22



A bar in Naples
Shot as part of a story for the London 'Sunday Times' about the fading grandeur of some European cities. Ken found that the presence of his Gandolfi camera and the imaginative 'pidgin' Italian of his assistant Jean Luc Bernard helped to relax his subjects into natural poses

Still life A set up shot for the makers of Glen Grant whisky to emphasize the time malt whisky has to remain in the barrels. Ken used the people who worked at the distillery in Scotland as his models and lit the shot with a Brauncolor 6000 joule unit





Ken Griffiths

the brief he has been given.

Often the brief is fairly loose. For instance, for an advertising shot he did recently for Nike Sportswear, all he was told was that the picture must show a man running alone through an urban landscape after a heavy shower of rain. It was to be shot in England, but should look European rather than English, so anything identifiably English such as cars and street signs had to be kept out of the picture. He was given a rough sketch to work from, but this was not really very useful.

'The art director and I spent a while working this one out and eventually did the shot at Camden Lock in north London. We had this guy running along. But it was still dry, so we threw water on the pavement and fortunately it looked like rain. It was very dark and we had to set up our own lights. The final picture bore no relationship to the sketch, but it did have the same feel—dark and moody with the chap in isolation. In fact the advertisers liked it so much that they changed the whole ad. Now the copy reads: "Nike Sportswear, Camden Lock, London". I've done another shot for that campaign in Paris and I've now been given two more to do elsewhere.

Other briefs are much more tightly structured, typical of these is an advertising assignment he did for Heineken lager. The brief was to show a tanker with Heineken lager written on the side parked in front of the Leaning Tower of Pisa in Italy in three ten by eight shots

Cane cutters of Tuxtepec One of a series of atmospheric shots taken for a brochure about the Swedish firm SKF to show its international operations

that joined together to give a complete panorama of the scene.

Unusually, Ken Griffiths combines advertising photography with a considerable reputation for magazine work. His earliest editorial work was for the British *Daily Telegraph* in 1971—a trip to Russia that he set up and planned himself. 'We had a lot of trouble at a couple of points—most of my pictures were confiscated by the KGB. I was held by them for a couple of days and I lost all the colour film that I had, but I managed to keep shooting enough material to do a story that was eventually used.'

More recently, he has been working for the *Sunday Times* magazine for whom he did his first major assignment back in 1977. 'I'd been here eight years and I wanted to go back to New Zealand where I was born. The picture editor at the time, suggested I go back and "do some landscapes" for them—that was the brief.' I set up the flight and they covered my other expenses, though having a letter from the magazine was very useful. His editorial experience can often be immensely useful for his advertising work. Several years ago he did a series of portraits for a Bayer Chemicals campaign. 'We had to find several different situations which showed Bayer working well. It was very much a

Sunday Times type idea. It had to almost look like a *Sunday Times* picture spread.'

On one recent assignment, for the Swedish firm SKF Bearings, Ken travelled for nearly two months with an art director and a writer. 'It involved going to different countries where SKF Bearings had their offices, and doing something related to the people that would illustrate a story about SKF and how good they are. So in Mexico it was workers cutting sugar-cane. In Brazil it was a train pulling iron-ore out of the jungle. It was more to do with illustrating the country through an interesting picture than it was about photographing bearings.'

Although he has managed to develop a very personal style through both his advertising and editorial assignments, Ken realizes the shortcomings and limitations of doing only professional work. 'I've got to pursue some of my own ideas, otherwise I'll end up a vegetable. Luckily, I haven't got so many commitments—I haven't got any staff. Now I'm changing my direction a little more. I've seen a number of things in this world and I feel I should do something about it—like the destruction of Brazilian tribes in the Amazon, the wiping out of trees in Ecuador, the treatment of deprived and tribal people.'

He has a number of personal projects in mind and one is particularly close to his heart. 'The next job I do for myself is going to be just me and a stand camera, photographing the aborigines in Australia.